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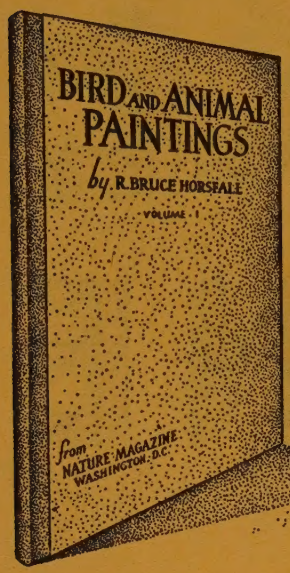

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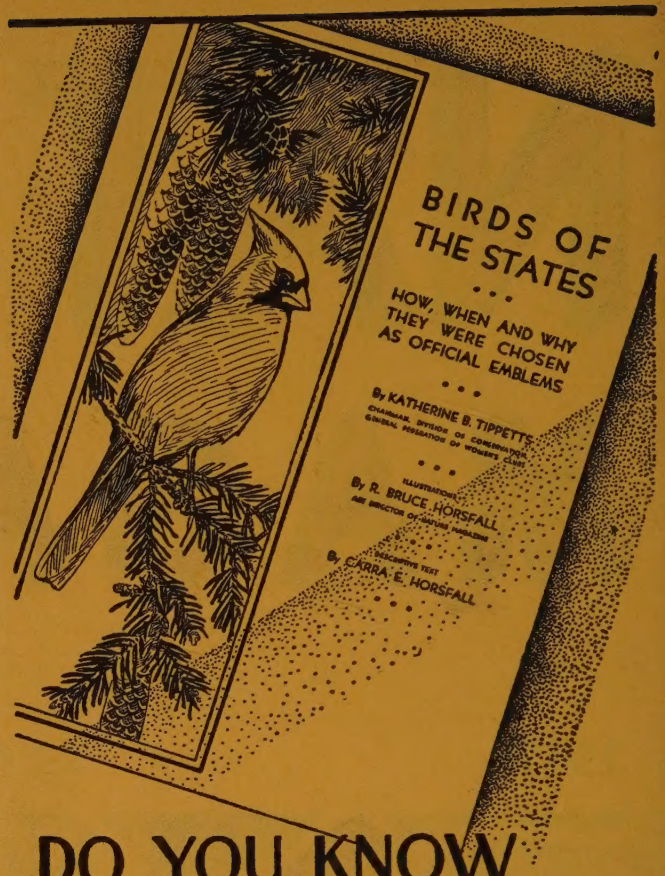
BIRDS OF THE STATES
HOW, WHEN AND WHY THEY WERE CHOSEN AS OFFICIAL EMBLEMS
By KATHERINE B. TIPPETTS
By R. BRUCE HORSFALL
By CARRA E. HORSFALL

DO YOU KNOW The Bird of Your State?

or of the 42 other states that have adopted official birds?

The movement to select an official bird emblem for every state only recently was launched as a nation-wide movement. Some of course had adopted official birds earlier. Altogether, 43 states have now selected a bird to represent them as an emblem.

The fascinating story of how, when and why the various states selected the birds to represent them is told in this book by Katherine B. Tippetts, former Chairman of Conservation, General Federation of Women's Clubs. Illustrating the book are 30 full color paintings of the various birds by R. Bruce Horsfall, the famous wild life painter, with descriptive text by Carra E. Horsfall.

Every home and every school should have this book. It is a fascinating bit of history combined with an authentic and interesting survey of the birds of America. A handy table in the front lists the birds together with the official flowers of the states.

The 16-page book, with 30 illustrations, is offered to readers of Nature Magazine at 25 cents a copy. On orders for ten or more copies, the price is 10 cents a copy.

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Kirtland Society

Pioneer scientist and naturalist, Dr. Jared Potter Kirtland, during a full life of 84 years extending from 1793 to 1877, is still an inspiration to naturalists of today. Under his leadership the Cleveland Academy of Natural Sciences was founded in 1845, and, following the Civil War, was reorganized and called the Kirtland Society of Natural Science. When the Cleveland Museum of Natural History was established in 1920, the Kirtland Society was inactive but was revived and merged with the Museum of Natural History. Finally, in September, 1940, the Kirtland Society was formed again under the auspices of the Museum to bring together groups with special interests in natural science, to provide assistance to such groups, and to foster the spirit of scientific research in natural history. The Society now has under its wing bird, mycology, geology, tree, mammal, reptile and photographic clubs, each named for Dr. Kirtland. An interesting discussion of this work is presented in a booklet entitled "The Kirtland Society," written by Arthur B. Williams. It contains a brief biography of Jared Kirtland, notes on the activities of the several clubs, and a list of publications of Society members between September 28, 1940, and December 31, 1942. It is the first bulletin of the Society and one of the popular publications of the Museum.

Farm Boys and Wildlife

We have an interesting and provocative letter from Leland White, who lives in Bonne Terre, Missouri. Although he does not give his age, we gather that he is a farm boy who has done a bit of thinking about other farm boys. He writes:

"I think it is tragic the utter ignorance and disregard shown by rural young people toward conservation and its aims. The young people of our rural regions look upon promiscuous hunting and trapping as their only means of recreation. This seems to be the only kind of outdoor sport our rural boys seem to know. Why can't they be taught other ways to appreciate the woods and wildlife without destroying either for pleasure or profit? Our farm boys are the ones who should know the most and care the most about conservation."

We should be very much interested to hear what other farm boys—nd girls—think about Mr. White's iews.

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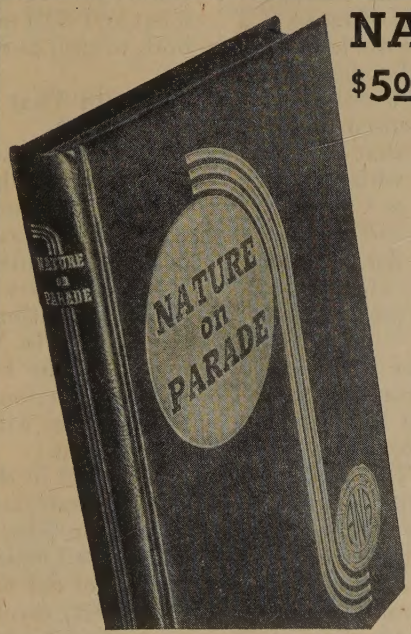

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Camera Trails

By NORRIS W. HARKNESS

At the Trout Run

From time to time the editor of Camera Trails has pulled boners that shamed him. Once he (this is definitely the moment to speak of him in the third person) twisted a whole roll through his Super Ikonta B with utmost care, only to discover when he got back to the darkroom that there was no film in the camera. But he hit a new low when he went off on an assignment to photograph the workings of a tungsten mine in Arizona. The list was checked—extra film, flash bulbs, floods, the synchronizer and two extensions with reflectors for use away from the camera, filters, lenshood, tripod, meter—everything right down to lens tissue and the small screw driver he carries for emergencies. He traveled 300 miles by train, 75 by car, and ten on foot—most of the last ten up hill over a narrow, rough trail. He arrived at the mine, slept soundly, ate a big breakfast, and was all ready to go. Then he found that the camera was resting peacefully at home, 385 long and weary miles away.

However, I had better luck with pictures of trout going over a fish ladder on their way upstream to spawn. I remembered the camera, and took along the flash gun to use in the event that the direction of the ladder might throw the fish into shadow. The run was a concrete moat at one end of a dam about nine feet high and with perhaps a foot of water running over it. The top of the dam at the ladder end was raised above the water line to furnish the fish a somewhat calmer area, and to help them find the ladder. The run itself was about six feet wide with six steps of eighteen inches or so each.

I took up my position first at the lower end and watched until I found where most of the larger trout seemed to jump. Then I chose a viewpoint that gave me a contrasting background, with their dark bodies against rushing white water and a working distance of five feet to fill the whole negative area with just the ladder and—I hoped—the fish. From the depth-of-field scale on the camera I found that f/8 would get both walls of the run sharply when I focused on the five foot mark, and the meter indicated that I could use $\frac{1}{400}$th second when I aimed it at the white water.

That seemed too high a shutter speed so I checked the meter against the back of my hand and reduced the speed to $\frac{1}{200}$th in order to get more detail in the dark fish and their shadowed under-sides. Then it was simply a matter of finding a comfortable position and waiting for the fish to do the rest.

After eight or ten shots that felt right as I made them, I moved to the upper step in the run and tried again. The light was a little brighter, but I could not get any shooting position at the level or below the fish and the results were not as exciting. The best and most impressive pictures will be made with the camera as low as possible to make the jump seem higher, and, of course, the shutter speed needs to be quite high at the short working distance in order to stop the fast movement of the fish and the falling water.

However, I found that a slower speed, down to $\frac{1}{100}$th second, would catch them motionless if I timed the shot just as they hit the water after the jump. They seem to hang motionless for a few seconds—motionless, that is, except for the madly-waving tail. Good shots of that kind can usually be obtained from a position below the dam and just far enough from the falling water to keep the lens free from spray. The fish leap up, seem to strike the face of the sheet of water, and hang there for as long as ten or twelve seconds before they fall back and try again. You can almost see the disgusted expression on each face as his gallant attempt fails.

The important factors to keep in mind in such pictures are the viewpoint that will provide a good background for the fish, an aperture that will give sufficient depth of field to get the fish sharp wherever he may jump in the picture area, and the fastest shutter speed possible at that aperture to stop any possible motion. After these have been considered, it is only necessary to await the moment when the fish is just where you want him. And, when they are running as they do in so many streams, you will not have to wait long.

If there is a fish hatchery near you, or if you have a fisherman in the family, these fish ladder pictures will go well in a series that might include the whole life history of the trout, or of whatever fish is most plentiful in your area. The series might start with the hatchery, the egg collection and fertilization, the growing and feeding of the young, and their ultimate distribution to the streams that will be their home. All the details of the work of producing the fish should be included, and the set might be finished with shots of the other end of the story, the catching of those same fish grown up.

The fishing pictures are easy to do effectively if we remember that they must tell a connected story that begins with the preparation of the equipment and ends with the cleaned fish in the frying pan. Or you might even carry it to the point of showing different cooking methods both in camp and at home. Any single part of the series will be fun and productive of good pictures for almost any photographer with any kind of camera provided he keeps that story idea in mind, but the whole series, complete in every detail, will be more interesting and even exciting. It is another of the innumerable camera series that offer the Nature photographer fascinating ways to use his equipment and skill in making pictures that will be valuable both to him and to all those who see them.

This and That

Announcements of new products of interest to Nature photographers are few and far between—as they are likely to continue to be for the duration. The restrictions on materials necessary for the manufacture of cameras, enlargers, accessories, chemicals, and film have forced suspension for the present, or at least a severe reduction in the quantity that can be made. Indications in Washington seem to show that there may be some lessening in the severity of certain of these restrictions, but we will be safer to assume that our supplies will not return to normal until after victory is won.

Our part in the national photographic picture is to use our materials and equipment carefully and to the best advantage. That involves good care of what we have; good maintenance of the equipment and proper storage of the materials we have on hand. Repairs by an expert, careful cleaning of darkroom outfits and protection from rust of all exposed metal, and storage in cool, dry place of all sensitized film and paper is imperative if we are to get the most from what we have

and can obtain under present conditions.

Even more important is the purchase of what material we need in small quantities that avoid any hint of hoarding. There is enough film and paper to go around if each of us uses all that he buys, or rather buys only what he will use immediately. The man who stocks up on any item on the photographers list is depriving some other camera man of something he needs to be able to work at all. Buy what you need and can use but leave the rest for the next fellow. It is the fair way and the patriotic way, and certainly we need not question the patriotism of photographers.

The Question Corner

P. L. I. of Atlanta, Georgia, writes: "I may be opening an old subject, but I am a comparatively new reader of NATURE MAGAZINE. In making pictures of plants and flowers is it better to shoot them where they live and grow, showing their setting and the natural background, or are the results better if the flowers are taken indoors? If the outdoor shooting is preferred, should some neutral background be placed so as to cover possibly confusing background objects? I have tried all three methods and cannot make up my mind which is best."

ANS.—You are indeed reopening an argument that began when I suggested the use of a neutral background placed behind the subject. A number of readers supported that system, but more preferred the straightforward picture of the plant in its natural habitat. Few thought that cutting flowers or plants to photograph them indoors was good business.

From the pictorial standpoint, the added background plan is probably the best, although carefully arranged flowers and branches in indoor settings are effective. Close-ups of individual leaves and petals that will be shown greatly enlarged are best made indoors where background, lighting, and movement are all under perfect control, but for straight Nature shots, the unposed, unaltered natural setting seems to be most desirable to the great majority of those who expressed opinions on the subject.

In other words, the subject and the purpose of the picture are the controlling factors in deciding which plan should be followed. The best idea is to shoot some special subject in several ways and then later decide which makes the most useful picture. No one rule will cover the whole field.

G. K. McM., Quebec, Canada, asks: "What toner is best for the snow scenes I have been making all winter? In straight black and white they have a brownish tone that does not hold the coldness of the weather and I'd like to improve them."

ANS.—The old standard gold toner that gives the prints a slight blue tint makes the coldest and most natural snow scenes. The shadows in snow in sunlight are actually blue, and the gold toner gives very nearly that same blue if it is not carried to extremes.

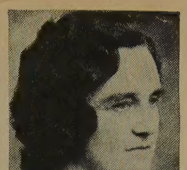
The toner is a three-solution affair. Bottle "A" has 50 grains of thiocarbamide or thiourea in 8 ounces of water; bottle "B", 50 grains of citric acid in 8 ounces of water; and bottle "C" 15 grains of gold chloride in 8 ounces of water. One ounce of each stock solution mixed with seven ounces of water will work well.

The gold toner works best on chlorobromide papers, developed as usual but fixed in a non-hardening hypo solution. If the emulsion is hardened the toning will take longer but will work eventually. In use, the prints are simply immersed in the toner and left there with occasional agitation until the desired color is attained. Be careful not to tone the prints too far. The faintest tint in the grays is enough and the cold effect should show without your being really conscious of any blue color.

F. R., Sea Girt, New Jersey, sends several prints and asks: "Why are these prints fuzzy? I made them with my box camera that is supposed to show everything sharp and generally does, but these are not. What did I do?"

ANS.—Box cameras get everything sharp from a certain minimum distance to infinity, the minimum distance varying with different makes and sizes of cameras. Usually the shortest working distance is about seven or eight feet, but some of these prints were made at four or five feet and the subject was simply too close. In the two with distant buildings, the camera wiggled as is shown by the all-over fuzziness. If the whole image is out of focus or soft, the camera moved when the exposure was made, and if only part of the subject is fuzzy, then either the subject moved or it was too near the camera. Try keeping the subject at least eight feet away and hold the camera absolutely still when you make the shot.

Send your photographic problems to the editor of Camera Trails for solution.



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We Are Sorry

In the April issue on page 191, Maurice Brown referred to *Ficus elastica* as "the all important rubber plant which has helped to revolutionize civilization and to bring nations into mortal combat." We wish we had a little rubber to erase this error. *Ficus elastica* is the rubber plant of the florist and our homes of a generation ago. While it produced some rubber in its native and wild state, it went quickly from the picture when the *Hevea* rubber trees proved so far superior for cultivation and as a source of raw rubber. Soon we are likely to refer to rubber with chemical symbols instead of botanical names. We apologize for letting this get by, and when we see such slips we reflect that the human mind is a strange thing. We knew better.

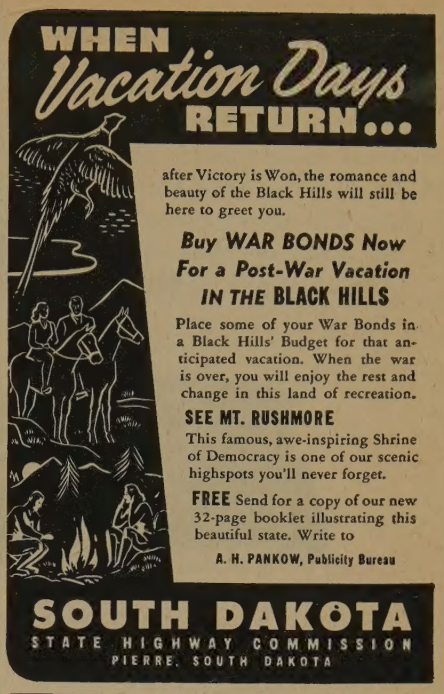
Trail Manual

In 1939 Sterling W. Edwards, Box 37, Forest Glen, Maryland, brought out a little pocket beginner's manual entitled *Cooking, Carrying, Camping on the Appalachian Trail.* It was received with evident enthusiasm and the first edition was exhausted. Mr. Edwards has now revised the booklet, added material, brought the data up to date and published a second edition. It is available from him at the address quoted for twenty-five cents.

Poisonous Reptiles

Poisonous Reptiles of the World: A Wartime Handbook. By Doris M. Cochran. Washington, D. C. 1943. The Smithsonian Institution. 37 pages. Illustrated.

This is the latest addition to the series of "War Background Studies" issued by the Smithsonian Institution, and is the tenth in the series. The author, who is associate curator of reptiles and batrachians of the U. S. National Museum, points out that of some 2400 different kinds of living snakes, less than 200 are dangerous to man. The chance of being bitten by a poisonous snake is small, she says, adding that for every 200 people who die from automobile accidents only one is killed by a snake bite. Vigilance, however, is necessary in snake country, and knowledge of the dangerous snakes is important—hence this booklet. It is designed to be of aid to members of our armed forces in various parts of the world, and fits into the important work of training our men in natural history as a part of their military preparation.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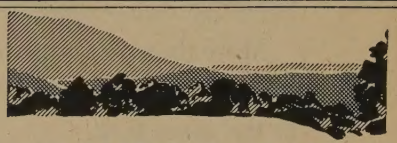

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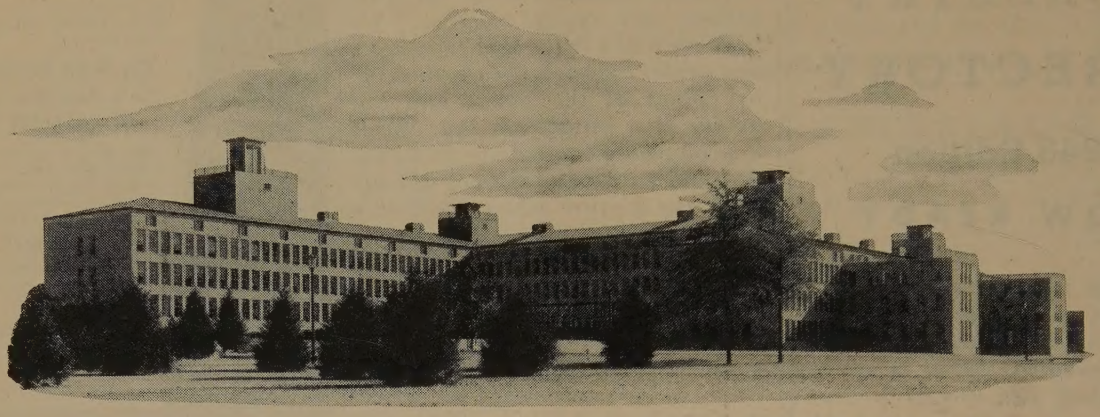

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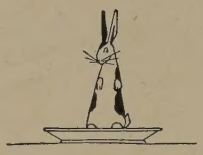
Contents Noted

Maryland's Department of Game and Inland Fish has gone to great pains to recodify the State's game and fish laws. One result of this labor reads: "The term vermin shall include all wild animals not classed as game animals or fur-bearing animals, and all wild birds other than game or protected birds." Then the code lists as "unprotected birds" the blue jay, English sparrow, European starling, kingfisher, buzzard, crow, *all* hawks and owls and the *eagle*. The italics are ours. Most hawks are valuable, and our National Bird, the eagle, is protected by Federal law. As J. Hammond Brown well says in the Baltimore *News-Post*, this "is completely outmoded by modern scientific fact and is a full generation behind the times." May we add that so long as such codes and laws are made at the prejudiced dictates of sportsmen—or their hirelings in public office—just so long will we have such ignorantly-drafted rules as these.

Words are strange and wondrous things, and too many people use them without sufficient respect for their value and their meaning. We would be better off if words were rationed. An example of how words take on varying significance is found in a recent release of the California Division of Fish and Game. Reporting on the 1941 hunting season, the Division records a *grand* total of 5,673,282 head of game killed. What is grand about it? It is certainly not grand for the birds and mammals killed, or for people interested in wildlife for wildlife itself. The release points out that the 1941 take was not as great as in 1940, but *the drop was not enough to be alarming.* Alarming to whom—the game, or those who hold their jobs by virtue of hunting licenses sold? The report records that a forty-seven percent increase in the pheasant kill *indicates an excellent condition of this species.* It "ain't necessarily so." Yes, words can express bias, mislead, get in the wrong places, or do a poor job of telling. We should stand more in awe of them.

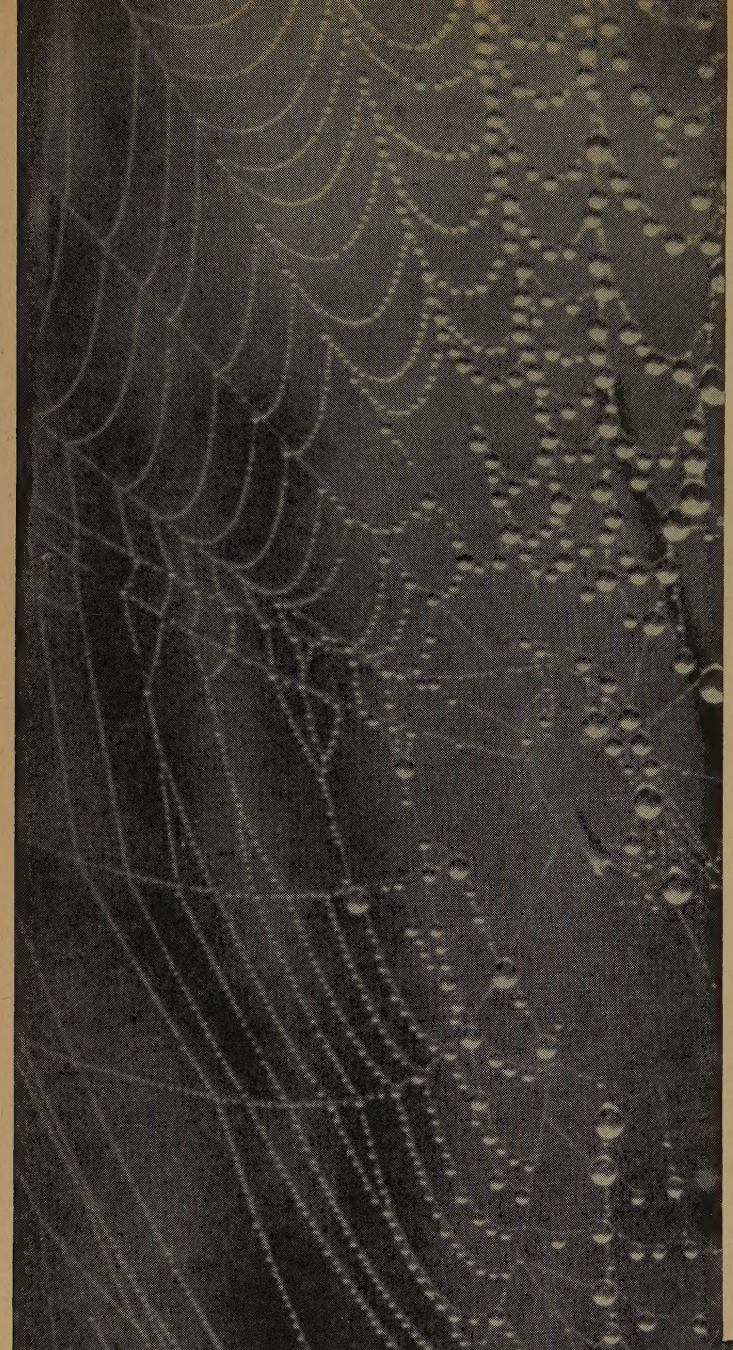
Ivan the Terrible, the little marmoset whose love-life was revealed to a prying world in our March issue, aroused great interest. His story caused many people to covet his counterpart, a yearning that it is probably difficult to satisfy these days. A Sergeant in our Air Forces, expecting momentarily to be sent overseas, sought a marmoset to serve as company for his wife during the inevitable separation. There was a disillusioned note in a letter from sixteen-year-old Billy, who wanted to get a marmoset to replace his pet dog, killed a few weeks before by an automobile. His mother, Billy said, told him he could *not* have another dog, but that he *could* have a marmoset "because she thinks it is impossible for me to get one." We gave Billy some addresses of pet dealers.

"How's your rabbit hutch doing?" says Mr. Suburbanite, settling into the train seat and unfolding his newspaper for the commuting interval to the big city. That is, he does if he takes the suggestion of the Fish and Wildlife Service that you raise rabbits in your back yard to eke out the meat ration. They have even issued a pamphlet to tell you how to do it. Unquestionably this is a good idea, but we are glad our back yard is not adequate to the purpose. We have a brother-in-law who raised a pet hen from a chick. One day his mother harvested her and served her up, crisply fried. He ate her, unbeknownst, but has never eaten chicken since. We are that much of a sissy that we would be unable to down Oscar, the rabbit, after he had wriggled his nose at us and eaten from our hand the lettuce we sneaked from our salad.



A friend and contributor of ours, a professor of botany, recently queried his class on the relative merits of various magazines in a course on economic botany. "I have found that for general accurate reading Nature Magazine is the one I would choose," writes one young lady student. "It gives good accounts of plants which are not ordinarily discussed in other periodicals because of lack of public interest, but many of these plants are important in the war life we are leading. . . . The biggest fault with Nature Magazine for use as a reference for economic plants is that it is too easy to become side-tracked on the other articles. I have never yet read a botany report in Nature but what I have read at least three other articles in the same issue." Thus, it appears, we are sabotaging the educational system.

R. W. W.



Arachne

By GLADYS GAIE ROGERS

Photograph by Hugh Spencer

She rears her silken pillars in the breeze
On sills and vines or on low branching trees.
The aisles she threads with suppleness and poise
Without a swerve her eight feet move, or noise;
What joy is hers when at the dawn she sees
Along her web a twinkling dewdrop frieze!
She looks in wonder and a puny fly
Knows not that when she's sated, he must die.
And then a mighty shudder through her goes
—A shudder she and every spider knows—
She leaps to safety and her walls succumb
Unmarked amid the insects' buzz and hum.
That jewelled symmetry that decked the pane
Now dangles lifeless—a distorted skein;
Arachne rights her legs and drops a line
Down to the wild beans's flowering vine,
And there she builds with tireless spinneret
Another home before the sun has set.

Says the Army to American boys raised on city pavements,—

"Soldier — Meet Nature"

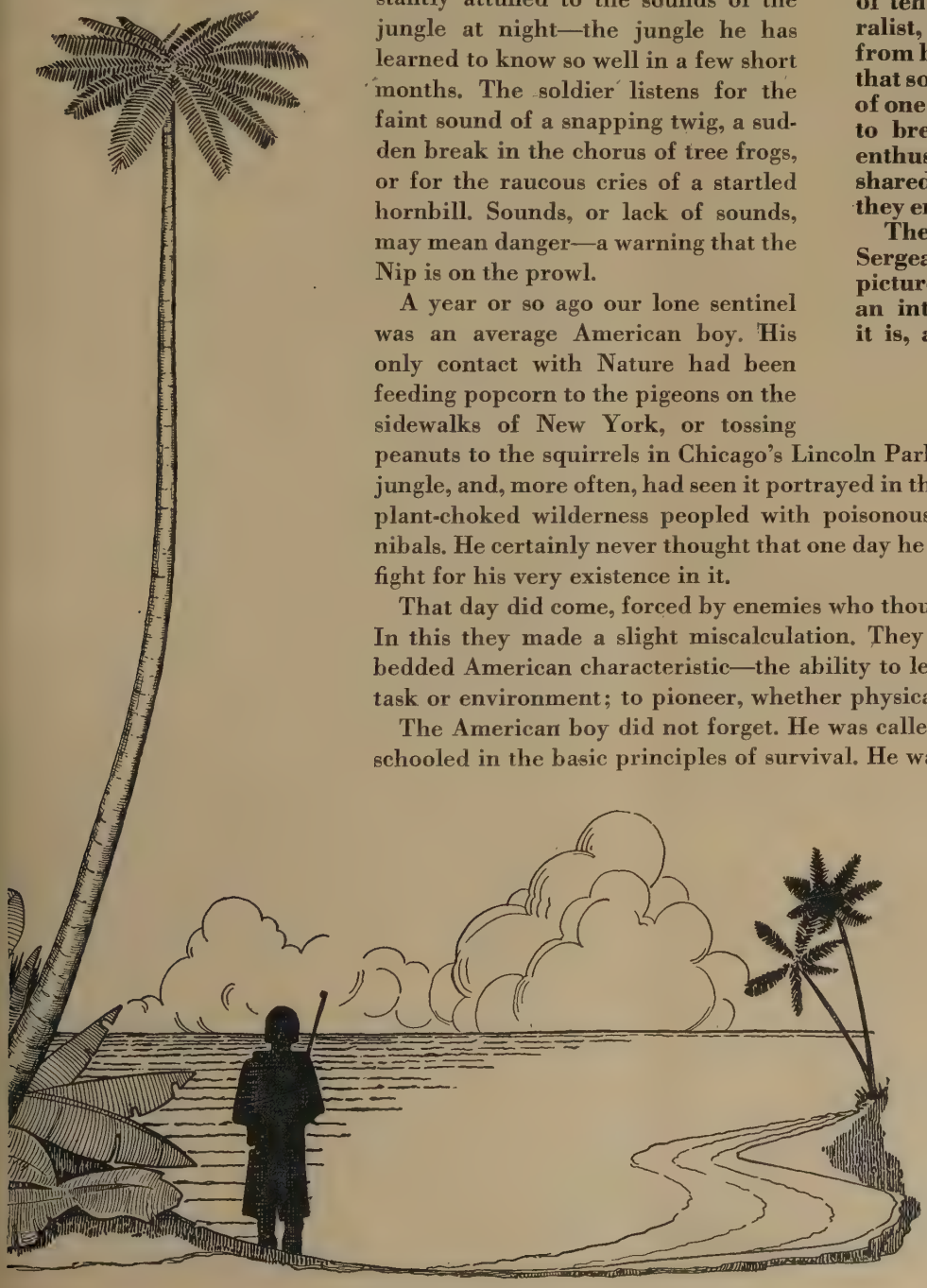
Illustrated by Lawrence D. Conway

By JUSTIN DENZEL

Sergeant Denzel is a nurse to a clanking behemoth in one of Uncle Sam's armored divisions. Sending us some stories, he wrote: "It has been said that war is a long period of boredom punctuated by brief moments of tense excitement. But, as a naturalist, I have found the boredom far from boring. Hardly a day has passed that some incident, involving wildlife of one sort or another, does not occur to break the monotony. From the enthusiasm of the soldiers who have shared these experiences, I am sure they enjoyed them as much as I did."

The stories were good, so we asked Sergeant Denzel to give us a general picture of the soldier and Nature as an introduction to the tales. Here it is, and the stories will follow.

It is one A.M. in the Solomon Islands. The night is moonless and dark. A group of palms stand dimly silhouetted against the almost black horizon. Hidden in the darkness of this tropical canopy a lone American soldier stands guard, his rifle held ready for instant action. His body is alert; his eyes peer into the night. His ears are constantly attuned to the sounds of the jungle at night—the jungle he has learned to know so well in a few short months. The soldier listens for the faint sound of a snapping twig, a sudden break in the chorus of tree frogs, or for the raucous cries of a startled hornbill. Sounds, or lack of sounds, may mean danger—a warning that the Nip is on the prowl.



A year or so ago our lone sentinel was an average American boy. His only contact with Nature had been feeding popcorn to the pigeons on the sidewalks of New York, or tossing peanuts to the squirrels in Chicago's Lincoln Park. He had probably read of the jungle, and, more often, had seen it portrayed in the movies, usually as a steaming, plant-choked wilderness peopled with poisonous snakes, vicious cats and cannibals. He certainly never thought that one day he would actually see it; live in it; fight for his very existence in it.

That day did come, forced by enemies who thought the American boy was soft. In this they made a slight miscalculation. They forgot an old and deeply-embedded American characteristic—the ability to learn quickly; to adapt to a new task or environment; to pioneer, whether physically or mentally.

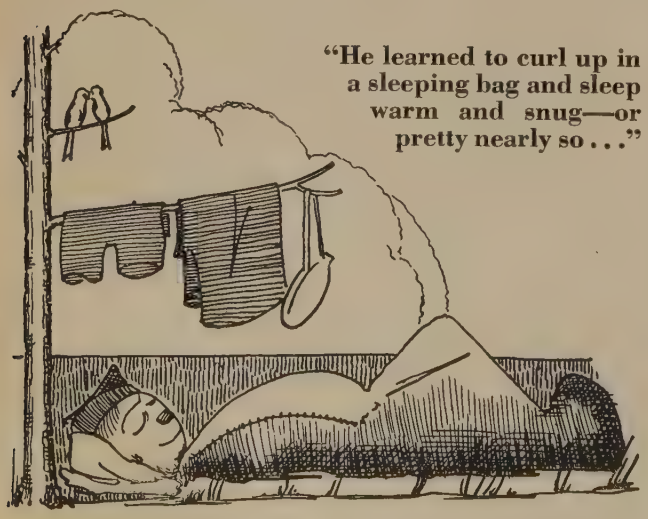
The American boy did not forget. He was called by the tens of thousands and schooled in the basic principles of survival. He was sent to sub-zero pinelands of northern New England; to semi-tropical marshland of Louisiana; to the rolling prairies of Kansas; to the parched deserts of California, and to the mountain fastnesses of Washington. He learned to curl up in a sleeping bag and sleep warm and snug—or pretty nearly so—while the snow swirled and the wind howled. He learned to wear a headnet in swamp country and to beware of stagnant water. He learned to tread cautiously in underbrush,

and to look first and step afterwards lest he disturb a sleeping rattler. In the desert he learned to do with little water and to carry a pebble in his mouth as a substitute. He learned to breathe in the rarefied air of alpine heights, and to guide himself by the North Star when emergency demanded. He learned all these things, and he surprised the enemy. But most of all he surprised himself, because he learned to love it. He was seeing and doing, for the first time, things he hardly dreamed he could do.

During the first few months after Pearl Harbor, some Americans criticized apparent Army inaction; arrogantly demanded explanation. "Why wasn't the American boy fighting? Where was he? What was he doing?" What was he doing?—he was learning. He was learning to be a Daniel Boone, a Robinson Crusoe and a Sergeant York, all rolled into one. He was learning every trick in the bag—and some that were not—so that it would be the enemy's turn to hold the bag.

While the American boy was learning, he was also seeing the animals and plants of this great and varied country of his. He found them interesting and fascinating. He knew he was not on a vacation, but he would not have been human if he had not stopped a moment to marvel at the ease and grace of a gliding turkey vulture, or the stately beauty of a tall sequoia. He would not be a man if he did not thrill at the sight of a seven-point white-tailed buck, or the splash of a giant rainbow trout. And he would not be the American species of the genus *Homo* if he did not have a respectful curiosity about a dark-banded water moccasin, or a hairy brown tarantula. And because he was a human, a man and an American he observed and asked questions. The Army encouraged this interest; knew that no matter how trivial or insignificant the matter might seem, it would some day stand him in good stead.

Naturally the wise soldier's first concern is one of self-preservation. The American boy wanted to know about venomous snakes and spiders; about poisonous plants and disease-bearing insects. He wanted to know his natural enemies so that he might be better able to defeat his human ones. To answer these questions the Army has set up a separate organization whose job it



"He learned to curl up in a sleeping bag and sleep warm and snug—or pretty nearly so . . ."

"I've always wanted to be a geologist, and . . . I made up my mind that if I come out of this war alive I will go back to school and be one."

is to gather and disseminate this knowledge. Its scope is world-wide. American troops embarking for foreign shores are provided with pamphlets seeking to describe the plant and animal life of the region they are about to enter.

Beyond this practical aspect of nature, most American boys have a bit of the naturalist in their makeup. This may have been dormant because of city life, but enforced contact with Nature brought it to the surface. He became conscious of the fact that there are other living creatures existing on this ball of mud besides himself. He saw evergreen trees as more than props on which to hang colored ornaments at Christmas time. He saw bees, ants and other insects, not as pests invented to break up picnics, but as six-legged creatures with habits of life in some ways as interesting as his own.

In many cases this new contact with Nature has changed the soldier's entire outlook on living values. Corporal Frank Rich is one of these. Before induction Frank worked in a rubber plant in New Jersey. He is married and has a boy of five. He enjoys the outdoors, and, happily, his wife's tastes run along the same lines. But Frank was tied to the city. It was his home, his job and security for his family. Outdoor army life in the rugged pine lands of Pine Camp, New York, soon changed his views. One evening a few of us were sitting around the fire discussing post-war plans. Quite casually I asked Frank if he were going back to his old job after the war.

"Not on your life!" he exploded. "I'm packing up my wife and son and we're going up to Alaska where a man can breathe a breath of fresh air. I've written and got all the dope on it. Why, every letter my wife writes she has some new angle on the idea. Yes sir, she's all for it. We're going to stake out a homesite and settle down in God's country."

I know a number of other boys who feel the same way Frank does, although they may not be quite so emphatic about it.

Another effect this contact with Nature sometimes brings out is to revive past interests and ambitions. Sergeant Jim Thorson is a good example. When the Army called Jim he was working in a hydro-electric plant in Niagara Falls. He liked his work, but ever since he had taken a course in physical geography in high school he had a vague longing to be a geologist. The necessity to earn a living diverted him, and so Jim's longing became a dream. In the past two years Jim has done considerable travelling with the Army. He has been from Maine to Tennessee, from Michigan to Texas, then to the deserts of southern California. He has seen high mountains and great rivers, rolling flatlands and gaping canyons. Seeing these things has set him to thinking. The other day Jim stopped me and asked, "What college would you suggest that offers a good course in geology?"

"I don't know, Jim," I replied, "I could name a number of them. Why do you ask?"

"Remember all those canyons we saw from the train on the way out here?" he said. "Well, I've always wanted to be a geologist, and after seeing those things I made up my mind that if I come out of this war alive I will go back to school and be one. I'll do it if I have to save every cent of my pay for the duration."

Such cases, many though they are, certainly do not imply that every soldier, from four-star general down to buck private, is going to stage a back-to-Nature campaign when the war is over. Nevertheless, when Johnny comes marching home again he will come with a broader outlook on life and with a far greater appreciation and knowledge of Nature.

The gradual change from tenderfoot to woodsman is almost intangible, yet you see it happening every day. You feel it, yet you cannot quite put your finger on it. You see it in the raw recruit watching, entranced, a flock of geese flying in V formation, splitting the clouds on their way to the blue skies of Canada. You see it in fellows like Private Patsy—the kid who quit school in the sixth grade and drove a truck from then on. You know it is taking hold of him when you see him running toward you, his curly black hair hanging down from under his field cap. You know it when he presents you with "a very screwy bug" tied up in his handkerchief, even if the very screwy bug does turn out to be a walking stick. You see it in the Corporal from Chicago, who,

". . . to sit patiently for hours on the bank of a little stream . . ."

rather than go to town on Sunday, coaxes you to take him with you on a field trip. And you know it has got him—hook, line and sinker—when at the end of the day he asks, "How long would it take to make a naturalist out of me?"

You discover it in the case of the cook with an ingrained fear of snakes—any snake—yet who came to be the proud and solicitous owner of a big black one. You meet it in the puzzled and interested questions about Nature that are put to one who is known in that outfit as "Doc", because he is supposed to know the natural history answers—and, too often, I do not.

Yes, and you see it in the tough Master Sergeant, who after the evening meal strolls off into the woods to sit patiently for hours on the banks of a little pond to watch a family of beavers stacking up a dam, or a pair of cedar waxwings raising a family in a wild cherry tree. And you feel it wholesale, when, after a hard day's march, the men unroll their sleeping bags and crawl between the blankets. The guards are posted and everything seems safe and snug. The stars shine brilliantly in the sky and appear to be hanging in the branches of the pines towering overhead. Then, from somewhere in the distance, a whippoorwill calls. Like an echo the metallic notes drift back and forth on the night air, and then someone whispers, "Boy—this is the life!"

"I'm packing up my wife and son and we're going up to Alaska where a man can breathe a breath of fresh air."

A native of the northern tundra around the world is the—

Baked Apple Berry

By ETHEL WILSON

ALONG with the mail, the packet boat carried me from Grand Manan to nearby Whitehead Island. Landing at low tide, I climbed the cleated gangplank, then headed for the bog. From a roof-top a carpenter paused long enough in his hammering to direct me to a path leading into the "hathe". There, he assured me, I would find the baked apple I sought.

One would think first of looking for a baked apple in the oven, or on the breakfast table. But this "baked apple", having eaten it raw and cooked, I now sought where it grew. So into the swamp I went, now rising on hummocks covered with a needlepoint of sphagnum moss, now sinking into miry foot-holes. Sometimes I sank into a velvety carpet of starry mosses—white moss that looked like edelweiss under the magnifying glass; red moss like glistening garnets in solid phalanx. Soft they were, as the softest cotton.

Gathering the baked apple berries that are growing among the leaves and moss on one of the islands near Grand Manan.

For two hours I walked along on the heath. Beneath my feet the moss was here and there embellished by tiny green sprigs bearing crowberry, and wee cranberry that was almost hidden. Towering above these were sheep laurel, Labrador tea and blueberry. Now and then I found baked apple, the object of my visit, against a background of midget black spruces and balsam firs, or the bare and silvery branches of by-gone trees.

A creeping plant standing only a few inches above the ground, it has leaves with fingers shaped like a maple but with a texture of the raspberry leaf. It is, indeed, a raspberry, and is known by the Latin name of *Rubus chamaemorus*. Its fruit is much like an amber blackberry when ripe. The popular name of baked apple varies with where one happens to be, and it is known as bakeapple berry, brake apple, cloudberry, bogberry, fogberry, yellowberry, moss berry and, in Labrador, Labrador berry. It is a circumpolar plant, growing in the high northern and Arctic regions and, in the eastern United States, extending as far south as the high land of Maine and New Hampshire and the eastern end of Long Island. It loves peat bogs and cool places.

Luther Burbank once visited Grand Manan and took specimens home with him to California. It is said that he was not successful in raising it there.

When baked apple plants are in bloom the native bog is white with flowers that resemble the blackberry blossom. When the fruit is ripe the bog in which the plant is profuse looks like a field of gold. Then the islanders go forth as a family to harvest the berries. Most of them say that they like them best raw and served with sugar and cream, but they are also canned. Opinions seem to vary as to its taste, from those who call it rather tasteless to those who compare its flavor to apricot, yellow tomato, cooked raisins, or stewed figs.

Whatever its taste and value as food, baked apple has a special place in my heart and memory, for I spent hours with it alone in its home, breathing the cool, clean air of the northern island bog that it graced, and reveling in the varied floral wealth abounding there.

★

Contrast

By MARY PRISCILLA HOWES

After the sunset—dusk,
From the candle, a smoky twist,
Ashes after a flame,
A beacon-light lost in mist,

Scarlet must end this way,
Always fading to gray?
Perhaps,

But it is hard to believe
That scarlet is all in vain
Since I watched a salamander
On a pilgrimage after rain.

Feathered Gems

A story of cedar waxwings

By GRACE KELSEY HURNI

It was February. In the valley of the Sacramento, the soft rays of a warm, winter sun converged upon a chilly world to charm it into Spring, while a cold northwest wind contended for the ascendency. The sky was a pattern of fluffy, white clouds, alternating with others of darker hue, the whole interspersed with patches of deep blue, like gray shepherds tending their flocks beside quiet waters. On such a morning in late winter I had an unexpected glimpse of pure beauty that I shall not soon forget.

I had just stepped out of my front door when my eye was arrested by a small flock of medium-sized birds, resting upon the telephone wires nearby. They were perched, motionless and silent, all facing toward me. They formed a rather compact group, and remained thus long enough to give a general impression of their singular beauty and to lead me to wonder as to their identity.

It seemed as though I were viewing a group of painted birds against the sky. The smooth satiny texture of their plumage and the striking pattern of their rich coloration suggested not feathers but a painting on silk. Their immobility and silence strengthened the illusion.

Suddenly, from behind the house a small gray object, speeding through the air like a plummet, launched itself at the flock of birds; they scattered as if they were eiderdown, but came together in a compact flock, and alighted on a neighbor's plane tree, several hundred yards distant. This was the beginning of an interesting avian drama that lasted for quite a few days.

We had transplanted, from the mountains to our garden, a half-dozen wild toyon bushes. These had now grown to a considerable size and their branches at this season were bending low with a burden of fine red berries. One of the mocking birds that had made glad the spring and summer for us with their incomparable singing, had decided to remain for the winter, attracted, doubtless, by the ample supply of berries. He evidently considered the toyons his domain.

The next morning, the cedar waxwings—for this is what they were—arriving at a time when the self-appointed custodian of the berries was occupied with other business, descended in a body upon the bushes. There was great rustling among the foliage, punctuated by high-pitched, sibilant, monotone calls. The bushes were literally alive with them, climbing about busily, gorging like little parrots on the berries.

Soft-wood browns and fawn-like tones, on head, neck and body, shaded into the slaty grays of wings and tail; the cinnamon brown of the throat and breast gradually blended into the soft yellow of the underparts; the tail, sharply tipped with chrome yellow, was accented by a black band above it; the velvety-black of the wedge-shaped pattern through the eyes extended back under the crest; the dark accent on the throat; the small red appendages that tip the wings like drops of sealing wax, combined with exquisite form to give the bird an air of elegance and distinction. The sensitive crest seems to act as a barometer of the bird's emotional nature. At rest it indicates well-being and calm. If startled or excited it is erected at once, and it is flattened close to the head in fear.

The gray shadow of the avenging nemesis cut the air once again and there was an end to the feasting. Hostilities continued, however, for several days until the berries were all consumed and the waxwings conceded the battlefield.

One late winter afternoon I was walking rapidly down the street toward my home in Berkeley. Facing the west, I was enjoying the effect of lacy silhouettes of bare trees against the lovely pastel coloring of the sunset sky when I noticed something I had not seen before. Scattered through the branches of a large deciduous tree, bare of leaves at this season, were uniformly-distributed, ashy-gray objects that appeared to be large pods. Could these have escaped my eye until now, when I was accustomed to pass that way almost daily? Determined to fathom the mystery, I crossed over to about the middle of the street. Suddenly the pods all took wing and flew away, but not before I knew them for a flock of cedar waxwings. They had characteristically alighted upon the branches, all facing in the same direction—which happened to be West—so that their backs were to me. Thus they blended with the wood gray color of their perch. As before, the motionless, silent perching habit of these extraordinary birds had produced a curious illusion.

For the next several days they were the uninvited guests of our neighborhood, gorging themselves at a five-course progressive banquet of toyon, cotoneaster, pyrocantha, nandina and escalonia berries. It was worth the price of having our bushes stripped of their bright fruits just to have the exciting experience of again seeing the waxwings close at hand.

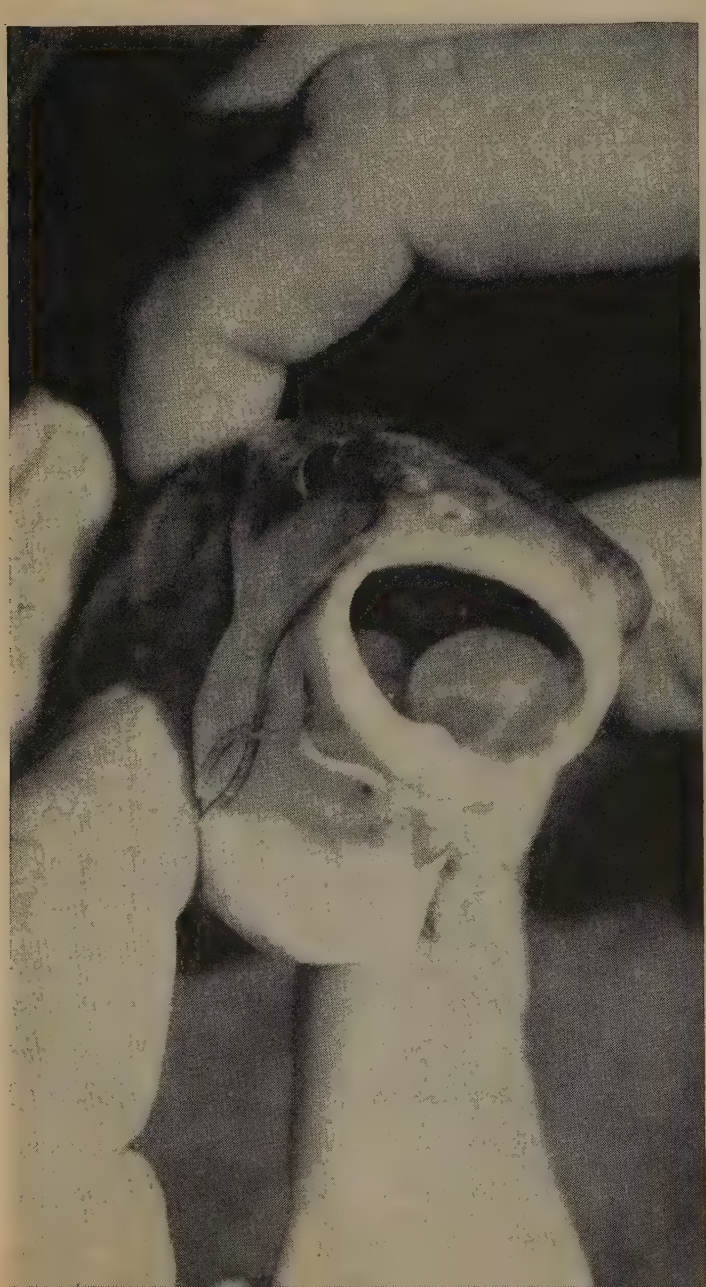
A fish that provides an incubator by carrying eggs in its mouth is the—

★

Salt-Water Catfish

By IVAN R. TOMKINS

ALONG our southern Atlantic Coast, and particularly under the docks where the salt water ebbs and flows, the salt-water catfish, *Galeichthys felis*, is likely to be found in considerable numbers from May on through September. In the middle of the summer they often come to the top of the water in such numbers that there is a solid mass of catfish "popping" their mouths. To the observer it is not quite clear whether they are feeding on some minute form of life, or are indulging in some sort of display. Perhaps as good a guess as any is that it has to do with mating.



The males have a curious way of using the cavernous mouth as an incubator. They carry in it a number of fertilized eggs, keeping them until they have hatched, and the young can get around to some extent. At other times good feeders, and quite willing to take nearly any kind of bait, at this time the males do not accept readily a baited hook. Yet one may pick up some in a cast net, in which case they immediately disgorge the eggs.

On finding a salt-water catfish with the mouth loaded with the ten or more eggs it will accommodate, one thinks at first that it is a case of cannibalism, something not at all uncommon among fishes. A closer look, however, will satisfy the most skeptical that the eggs are not an article of food. I have examined many of these fishes and have not yet found any eggs in the stomach.

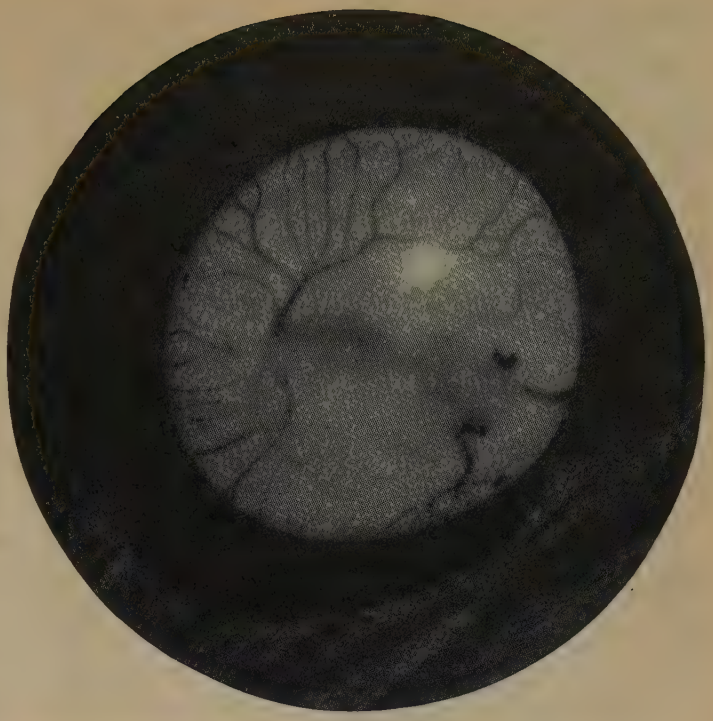
It is not quite clear how a single mouthful of eggs incubated each season will suffice to keep the numbers intact over a long time, for the mortality among the young must be considerable, as it is among most fishes. My own experience with the species, mostly gained by catching a netful or so almost every day through three summer seasons, indicated that this is so, that the male carries just one mouthful until the eggs hatch, which takes some time. It does not seem that there are many more males than females.

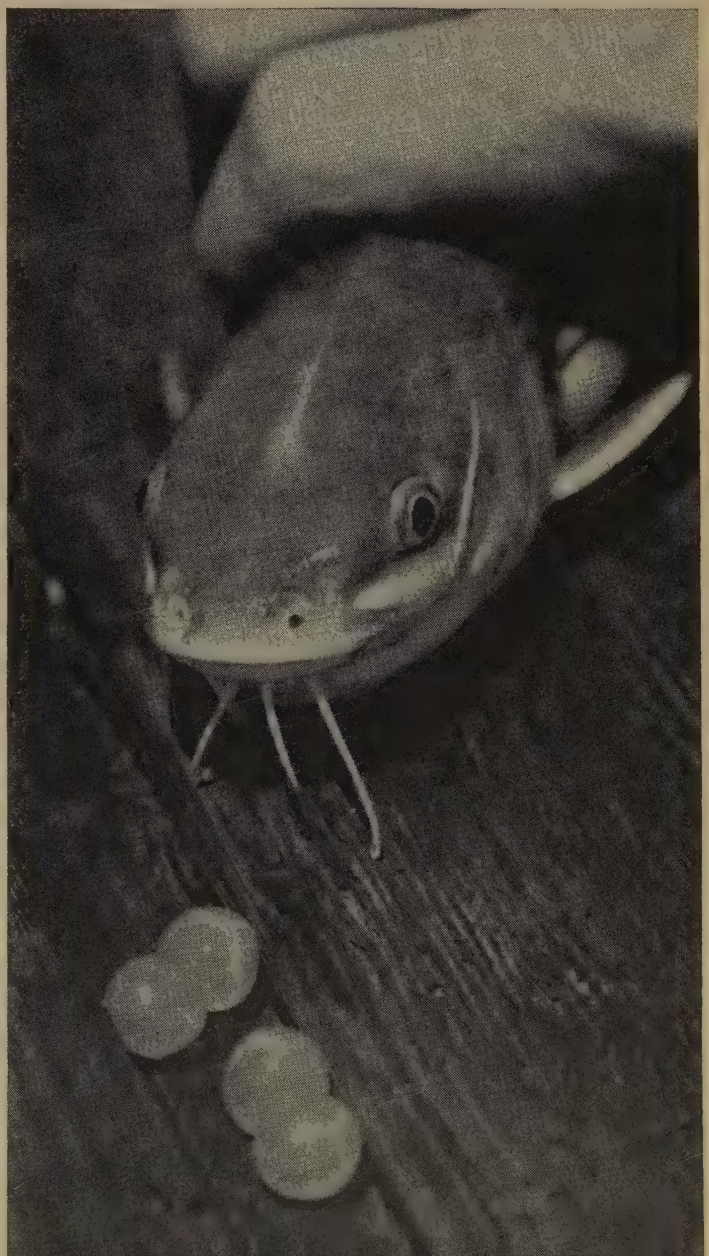
In early July, in Georgia, the eggs show only traces of an embryo. A week or so later the form of the head and eyes is revealed. Later the tail, which is curled around, can be seen to move back and forth; the blood vessels may be discerned spreading out from two centers, one near the pectoral fins, the other farther back along the spine. By the end of the month the bony plates of the head and back can be made out in part.

The eggs are from three-eighths to one-half inch in diameter, another fact that seems to indicate that only a few are laid. Those species of fish that lay

A peek within the mouth-incubator of the salt water catfish. About ten eggs is the usual capacity of the mouth and these eggs are between three eighths and one-half inch in diameter. The mouth of the catfish appears to be particularly well constructed to serve the purpose of an incubator and seems to be a sort of ante-room to the rest of the fish.

The partly-developed egg of the gaff-topsail catfish, a larger relative of the species here treated. The eyes are plainly to be seen at the right of the egg. The blood vessels dispersed over the embryo seem to have two centers, one near the head, the other well back along the spine. The egg shown was five-eighths of an inch in diameter. Below, a male catfish has disgorged some of the eggs that it has been incubating in its ample mouth.





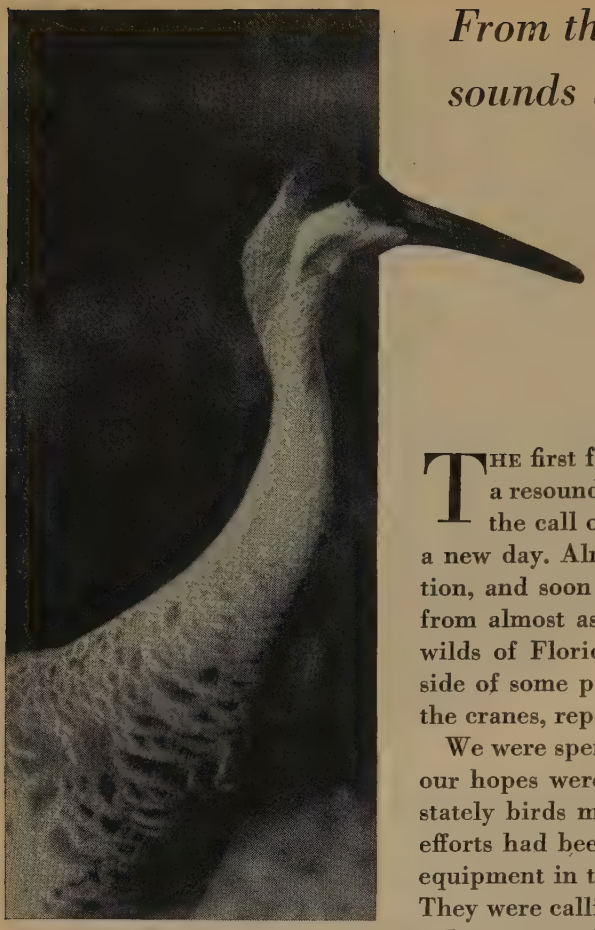
many thousands of eggs obviously must be able to produce only very small eggs. The method adopted by this catfish may be compared to that of the Lophobranchs, to which the peculiar sea horses belong. In this group the males have a ventral pouch, where the female deposits the eggs. Here the eggs are fertilized and here the young remain, protected and cared for by the male until they are able to make their own living. A further development of method is that of a few fishes, notably the guppies, which retain the eggs within the body until they hatch, and bring them forth able to fend for themselves. In the case of all of these the eggs are few in number.

The same trend seems to be continued in the amphibians and reptiles, which developed from the fishes, the eggs being relatively large and generally few in number. In these groups, however, parental care for the eggs or young occurs only rarely, the eggs usually being left to the care of the elements.

Hatching a catfish egg does not, of course, mean quite the same thing as, for example, the hatching of a bird's egg. With the fish the egg envelope merely allows the release of a small head and a small tail, attached to the upper side of a nearly spherical body, which slowly begins to lengthen out into the shape of a mature catfish. How long the role of protector is kept up, and what assistance there may be to the young fish while still protected in the parent's mouth, I do not know.

The mouth of this catfish is nicely arranged for an incubator. It really makes one think of a bony cage, through which the salt water flows all the time. This cage looks rather like an ante-room or a vestibule to the internal arrangements of the fish. The toad-fish, living in rock jetties and in holes over much the same range, also has a large mouth, resembling an old-fashioned snap pocketbook from outside, but the inside is moist and looks more like the inside of a stomach than the clean cage that is the catfish incubator.

Another species of catfish lives in salt water also. This is the gaff-topsail catfish, *Felichthys marina*. It is a larger fish, and seems to prefer swifter water, and does more of its feeding well off the bottom. I have seen it, however, strike at egg shells thrown over in garbage on the top of a swift current of water. Yet it, too, incubates its eggs in the mouth.



Profile of the Florida sandhill crane, sentinel of the prairie regions of the state, a wary bird that resents human intrusion and is an unwilling poser for its portrait.

From the Florida marshes, in early morning, sounds the call of the sandhill crane—

Trumpeter of the Prairies

By HUGO H. SCHRODER

Illustrations by the Author

THE first faint signs of daylight were appearing in the eastern sky, when a resounding "gur-roo" broke the stillness of the early morning. This was the call of a Florida sandhill crane, voicing his greeting to the dawn of a new day. Almost immediately an answering call came from another direction, and soon the trumpeting of a half-dozen birds could be heard coming from almost as many directions. I have made numerous trips to the prairie wilds of Florida during the crane's nesting season, usually camping alongside of some prairie hammock. Never have I failed to hear the "gur-roo" of the cranes, repeated many times at daybreak.

We were spending several days with the birds of the Kissimmee prairie and our hopes were centered on the prospect of finding a crane nest where the stately birds might oblige by posing for some intimate home portraits. Our efforts had been in vain, although just as we finished packing our camping equipment in the car, we saw a pair of cranes fly over with jerky wing-beats. They were calling loudly as they proceeded to their feeding grounds.

It was now the height of the crane's nesting season, so we concentrated on the search for their bulky nests about the small ponds and in the more extensive marshes. Wherever we found a growth of wampee, grasses and other aquatic plants in a likely-looking marsh, we halted and waded through the pond, hoping to flush a brooding crane from her nest. Sometimes these birds will crouch low on the nest, and unless a careful search is made, the site may remain undiscovered.

We had found indications of crane nest construction in a large marsh, on a previous trip, so we headed our car for this section. As we waded through the aquatic growth of this marsh, we were thrilled by the sight of a female crane rising from her nest and running through the water with giant strides. She went for some distance before taking flight. The nest was constructed of grasses and stems of the wampee, covering an area more than three feet wide and rising to six inches above the level of the marsh. Two large drab gray eggs, marked with brownish blotches, were in the nest.

Hurriedly retracing our steps to the

Male and female Florida cranes, the male in the foreground. He proved a good camera subject but his mate remained always in the background.

car, we gathered up the photo outfit and returned to the nest. The camera was set up on a stout tripod about ten feet from the nest and a string was run to the shelter of the trees on a nearby islet. The shutter was set, string attached to release and everything was ready for making an exposure. All we needed was the cooperation of Mrs. Crane or her mate. However, the female showed no sign of returning to her incubation duties within a reasonable time, so we decided that other methods would have to be employed if we were to succeed in securing crane portraits at the nest.

Even though luck had been against us, we kept up our search for another crane nest. Late in the afternoon we encountered another brooding bird, which rose from a nest containing a single egg. A convenient growth of a large number of bay saplings was present on an island in this marsh. A dozen or more saplings were cut for use in building a blind near the crane nest. These saplings were stuck in the muddy marsh bottom, while palmetto leaves were used to thatch the openings between the bays. On leaving the scene, we found a large cotton-mouth moccasin a short distance from the nest. This big fellow was dispatched at once, as we were not anxious to have him at large on our return in the morning.

A suitable camping site was found beside a little pond, about two miles from the crane nest. Early the next morning several pairs of cranes called from different directions, although we did not hear any calls from the region of the nest we had found the day before. As we entered the marsh, our hopes ran high when we saw the female leave the nest and fly to the east, where she dropped to the ground beyond the marsh. The male joined her shortly after, indulging in a queer dance for a brief period.

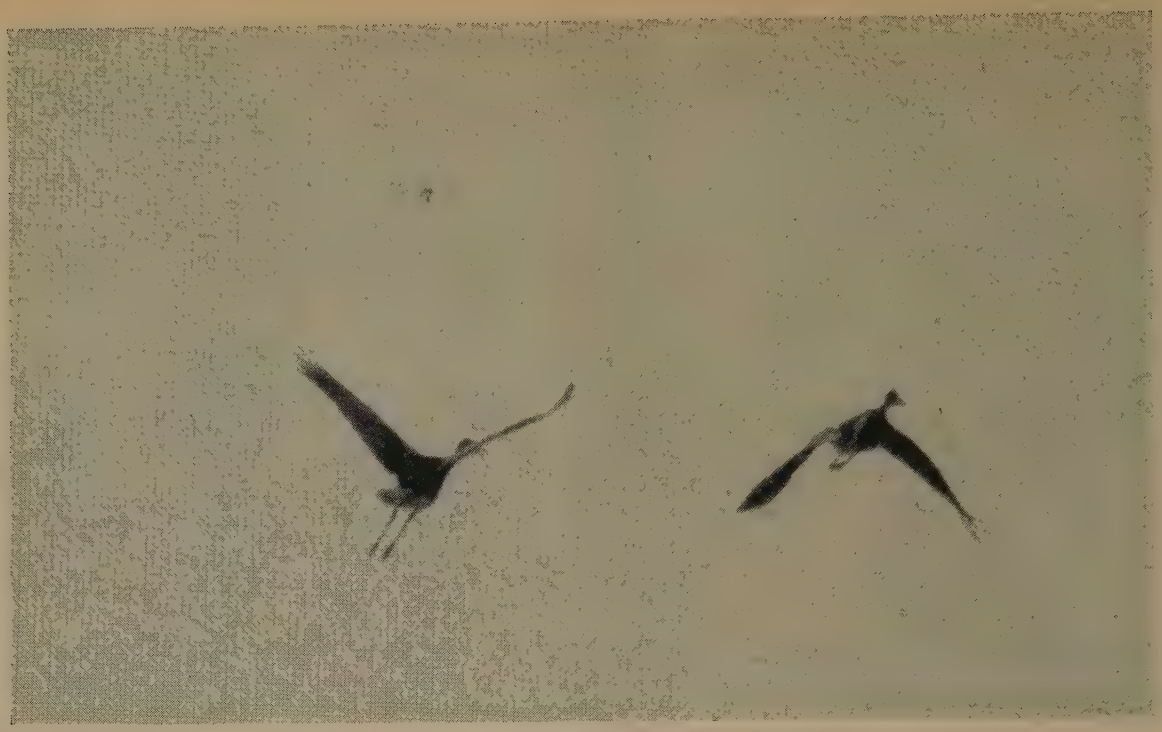
More palmetto leaves were needed to screen the wildlife photographers from the keen sight of Mr. and Mrs. Crane and some bay branches were used to cover the doorway of the blind. Our attention was directed to the returning cranes when we heard their loud trumpeting calls, as they circled once around the blind, flying low and continuing their whooping outbursts until they landed in the marsh at some distance from the nest. Both of the large birds gazed suspiciously in our direction for several minutes, then nonchalantly started picking up stray bits of food from the marsh water as though entirely alone.

The male crane was the watchman of the family. He started walking slowly in the direction of the nest, holding his head up, as though sniffing the air. After proceeding for several yards, he returned to his feeding mate. No doubt he consulted with her about the proper strategy to employ in coping with the situation. After a brief consultation, the majestic birds started walking slowly in the direction of the blind, hastening their pace somewhat as they came nearer. Occasionally the female lagged behind to take advantage of a stray morsel of food along the way.

Instead of continuing toward the nest, as we had hoped they would, the promenading cranes proceeded to a point of vantage at the rear of our blind. Evidently we had neglected to cover the back door thoroughly, for the keen eyes of the male noted the occupants of the blind, and he walked closer so that he might have a better look. The alarm note of a red-wing sounded near the blind and instantly both cranes voiced their disapproval of the activities of certain camera men on their home acres. Had we been able to translate the language of the birds we might have heard some uncomplimentary remarks.

When the calling subsided, the cranes started promenading again, heading toward the nest, but continuing on beyond it, for a distance of about twenty feet. Turning about, they retraced their steps to a point about the same distance on the opposite side of the nest. This was continued, back and forth over the same course, for a half-dozen trips, both birds calling frequently as they marched with slow and measured tread. The alarm calls were usually uttered by both birds, the female, however, sometimes beginning her call a trifle later than her mate; infrequently only one

A pair of Florida cranes on guard near the site of their nest in a marshy pond on the Kissimmee prairie of Florida. They are ever alert.



A pair of Florida sandhill cranes take to their wings from the marshy pond where they had been feeding. Their flight is characterized by its jerky character.

bird would sound the alarm note. Suddenly both ceased their calling, and walked out into the marsh, some distance from their home. There they seemed to lose interest in the strangers occupying the alien structure and commenced feeding as if nothing out of the ordinary had occurred.

The harsh, rattling call of an Audubon's caracara near our blind brought back the cranes. We were in the heart of the prairie country, many miles from the Kissimmee River, or any large body of water. Therefore we were astonished to hear a strange sound, somewhat similar to the distant purring of some smooth-running motor. We did not associate this sound with any of the birds of the prairie; in fact, we could not believe that any bird would make such a sound. Suddenly we noticed the male crane throw back his head, and, concentrating our gaze in his direction, we discovered the origin of the strange sound. He was uttering a sort of high-powered purring, such as we had never heard from the throat of any bird before. This strange purring is not audible at any great distance, so perhaps few naturalists have been fortunate enough to listen to it.

Then a pair of cranes in the distance began whooping and our birds started back to the vicinity of their nest. However, they would not go closer to it than about five feet. Their suspicions could not be forgotten, therefore the female would not trust herself to resume her duties of incubation. Fearful lest further interruption might prevent the hatching of the lone egg in the nest, we packed up our cameras and left the blind. Our collection of wild life negatives had been increased by the addition of several exposures showing Mr. and Mrs. Crane in various poses near their home. And we had discovered something new about crane behavior, and had heard sounds from the throats of these majestic trumpeters of the prairies that had not before been recorded by inquisitive bird students.

★

Box Elders

By ALLEN E. WOODALL

The elder leaves are shaken in the wind—
Coinage of beauty never over-run.
The laughing green of Maytime mystery,
Blossoming in the northward moving sun.
Elders grow fast, and drink deep of the earth,
Saving themselves when dry winds ride the plain.
Like us they have a passing hold on time,
They have gay leaves but weak and brittle grain.
They will not last; yet neither, then, shall we.
I hold them dear, while neighbors hack them down.
It fills my heart with gladness still to see
Box elders march with elm trees through the town.

Tracks Our Boys May See

By ELLSWORTH JAEGER

Drawings by the Author, these being reproduced about one-quarter actual size unless otherwise indicated.

JOHNNY DOUGHBOY is the great American explorer of today. Only to him are the routes of travel open in this war of wars. Our Frank Bucks and Osa Johnsons are now impatient stay-at-homes, while Private Yank and his comrades-in-arms range the far-flung trails of desert and jungle, meeting strange peoples and stranger animals. Especially is this true of our men with wings.

Exotic continents and romantic seas are now making the battle headlines, and our American warriors are following war trails into steaming jungles, arid plateaus, scorching deserts, and frozen Arctic wastes. And in these far-off places wild creatures that heretofore were seen by our doughboy explorers only in zoos and circuses are now everyday acquaintances. In the snows, in the sands and in the rich warm lands of the tropics, numbers of wild species register their autographs for our soldiers to see and to ponder over. Often the tracks are the only evidence of the animal's presence.

The footprint of the Indian elephant looks as if some one had been using telephone poles for stilts.

In the hot dust of North Africa the tracks of the striped hyena show their typical dog-like characteristic of clearly registering the claws. The hind feet of the hyena are smaller than the fore feet, and in India and Burma, where this grotesque animal is also found, this feature at once distinguishes its track from that of the wild dog of these regions. The demoniac laughter, shrieks, and cacklings of the hyena add a crazy note to the night sounds of the African desert. Hyenas are usually cowardly sneaks, but they might creep up and seize a man in his sleep. They will often play dead when cornered, and will endure the worst kind of worrying by dogs.

Another member of the dog-family residents of North Africa, in fact one of its smallest living members, is the fennec, a tiny desert fox only twelves inches in length. What he lacks in body size, however, he makes up in ears. In fact his ears seem almost as large as the rest of his body. The fennec's beautiful little tracks form a tracery on the desert as he searches for small mammals, birds, lizards and even fruits, for, like many of the wild dogs, he is more or less omnivorous.

A common track in North Africa is that of the dromedary, the one-humped camel, which has been so thoroughly domesticated that it is no longer found in a wild state. However, the camel does not seem to be happy in its servitude, and very often exhibits its disdain by spitting at its masters. The camel's foot is two-toed, having nails, not hoofs. The flatness and expanse of the foot are well adapted to sand travel.

Sand signatures in North Africa that every doughboy should know are the graceful curls and scrolls of the venomous *Cerastes*, the sand viper. It is well to walk with care to avoid treading on this sand painting, for directly beneath this design is the viper itself. Being cold blooded, this reptile cannot stand extremes of either heat or cold, and for protection from the deadly rays of the desert sun, it digs straight down into the sand. With wave-like movements of its body, the sand viper literally sinks into the sand, heaping the grains over its body in a graceful design that cannot be mistaken.

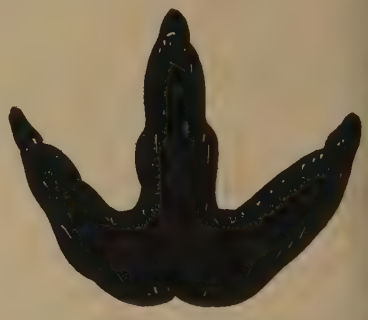
These graceful curls and scrolls mark the hiding place of the African sand viper.

The footprint of the North African camel, and, below, the dainty track of the fennec (about life size), and that of the African striped hyena.

As with the magic carpet of mythology, Johnny Doughboy can whizz off eastward on army wings to magic India, and there find tracks that make his heart skip a beat. In the soft jungle earth of this land of temples and maharajahs are the royal signatures of the king of kings of the animal world, the tiger. His royal track, however, is no different from that of any cat's except in size and, true to feline tradition, the claws are definitely hidden. Like the pet pussy-cat back home, he likes to claw trees, and he seems to have individual scratching trees, reserved for him alone. Often, in the hot, dusty jungle roads, imprints show where he has taken a royal dust bath. The tiger loves seclusion and often his spoor, as tracks are called in Africa and India, is the only evidence of his presence. He is a deadly antagonist when aroused, and will fight to the death with all the super-nine lives he seems to possess.

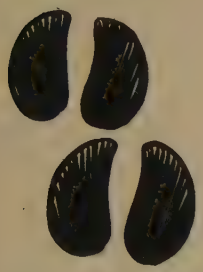
Strange as it may seem, this giant cat sometimes has a small dog follower. This is the jackal, the only animal in the whole jungle that has any relations at all with this deadly beast. The footprints of the jackal are often found near native villages, where they hunt in pairs. They are expert scavengers and will eat almost anything they can digest. Like the hyena, they play dead when caught. The jackal's vocal ability is most interesting. Its common cry is a long, wailing howl repeated three or four times, rising on a higher note each time, and finally ending with three yelps. Just before dawn, the distant yelps are taken up by the jackals close by and then passed on to others, finally fading in the distance. It is a common saying in India that the jackals relay their cries right across India from Bombay to Calcutta.

Most interesting is the spoor of the Indian elephant, in spite of the fact that it looks as if some one had used telegraph poles for stilts. In marshy ground an elephant's track may be sunk three or four feet deep. Just as the F.B.I. uses the finger-print system to identify individuals, so can the native trackers pick out individual elephants by the characteristic cracks on the soles of their feet. Elephants often make regular

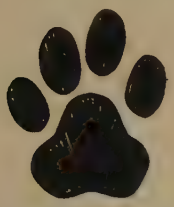


The dog-like track of the Australian dingo (about half size), and, right, the footprint of Australia's national bird, the emu. Below, the characteristic fore and hind footmarks of the kangaroo.

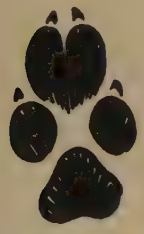
Footprint of the Indian tiger.



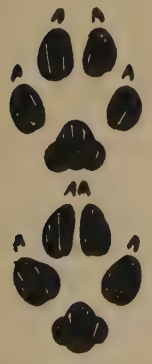
Spoor of the wild pig of India.



Mark left by the Burma leopard.



Print of the wild dog of Burma.



Front and hind footprints of the jackal.

trails, and in spite of their huge bulk, their paths are not much wider than those made by natives. Because the elephant's feet are cushioned with springy fibers and muscles, he can slip along the paths as silently as if on rubber tires. The elephant has five toes on each foot enclosed in a common covering of skin, and usually tipped with short hoofs or nails. The Indian elephant normally has five nails on the fore foot and four on the hind. The African elephant has only three nails on his hind foot.

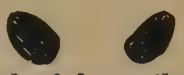
A spoor that brings a light to the Indian sportsman's eyes is the humble, cloven-hoofed track of the wild pig, for pig-sticking is a royal sport in the East. This animal, too, is distributed throughout India and Burma, but the jungle boar is usually heavier than those of the plains. This wild pig is most intelligent and very courageous, and does not hesitate to attack man or even an elephant, when aroused. The track is not the only sign of its presence, for this wild pig has a very strong pig odor and the boars often emit a powerful, musky scent that can be detected at quite a distance.

Over in Burma, Private Yank and his pal, Tommy Atkins, will find a different big cat's footprint, a track, however, only half the size of the tiger's pugs, but very similar in its make-up of four toes registered without a vestige of the claws showing. This is the leopard's autograph. Like the African species, the leopard of Burma and of India is one of the most widely distributed animals. Its sawing call sounds like the sawing of wood—sharp, double strokes, a regular thrust and return of the saw. When making this call, he keeps his mouth partly open, expelling the air and then inhaling, back and forth, over his palate. And, like the tiger, he likes to claw trees. Claw wounds from any of these big cats are most dangerous, since infection is sure to result.

The wild dog's track is common in Burma and India and is very dog-like except that the footprint is longer and narrower than the average track of domestic dogs, the two middle toes being thrust forward. Since the wild dogs usually run in packs, it is not uncommon to see a number of tracks together. As in other dog footprints the wild dog's spoor plainly registers the claws. Hunters dislike these dogs, for they often drive game out of entire districts, and their yapping and chattering "chuck, chuck, chuck" is always heard with disappointment by human nimrods.

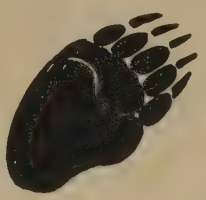
Private Yank is also visiting his Australian cousins of the Kangaroo Continent, that land down under, where some mammals carry their young in their apron pockets, and others

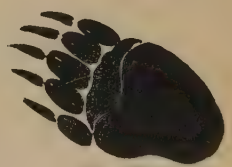
Track of the Alaskan moose.



Track of the caribou.

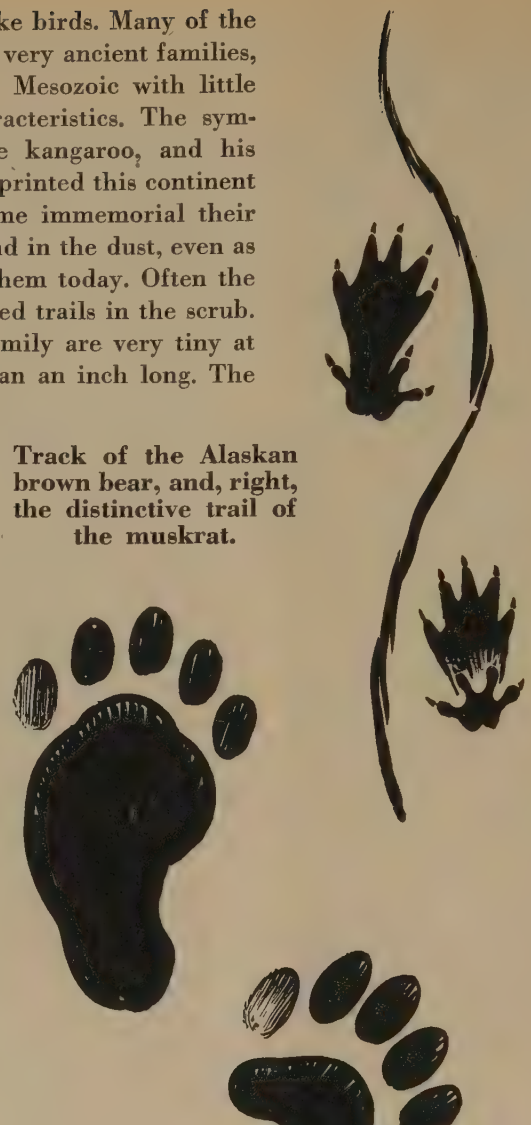
The snowshoe rabbit.





The track of the Alaskan porcupine is very definite, and suggests that this animal of the Northland must be decidedly pigeon-toed. The track is about one-third actual size.

lay eggs and may have beaks like birds. Many of the animals of Australia come from very ancient families, some going as far back as the Mesozoic with little change in their apparent characteristics. The symbolic animal of Australia, the kangaroo, and his numerous relatives, have finger-printed this continent from end to end, and from time immemorial their tracks and trails have been found in the dust, even as our doughboy wanderers find them today. Often the kangaroo will make well-travelled trails in the scrub. The young in this numerous family are very tiny at birth, being not much more than an inch long. The youngster looks like a red grub at birth, and climbs hand over hand into the mother's pouch, where it stays for four months.



Track of the Alaskan brown bear, and, right, the distinctive trail of the muskrat.

When travelling slowly, the kangaroo has a strange gait, swinging its large hind legs forward, while the tail and the fore legs hold its body in a sort of arc. When hopping, however, only the hind legs are used, the tail acting as a balance but never touching the ground. It can make twenty-five-foot leaps when speeding, and can clear a nine-foot fence.

Often shallow holes are found, where the kangaroo takes his dust baths. Boxing is a favorite sport with these animals, but the Queensberry rules mean nothing to them. They grapple and cuff each other soundly about the head and shoulders and for good measure give vigorous kicks with the hind legs. They seem to have regular three-minute rounds with rest periods in between. The kangaroo tribe includes the wallaroos and wallabies as well.

The dingo, the Australian wild dog, is a more recent addition to the animal life of that continent than the pouched mammals. It is thought to have been brought into the country by the Australian bushmen. The dingo's track is like that of any other fair-sized dog; but unlike most dogs the dingo never barks, giving only a most dismal howl.

The strangest mammal freak of the Australian menagerie is that scion of an ancient clan, the duck-billed platypus. Its peculiar tracks will be found by our doughboy explorers in the soft sand and mud of the river banks, for it spends much of its life in the water, dredging up with its peculiar bill the insects, shellfish and other foods from the river bottom. Both its fore and hind feet are webbed, and have stout claws for digging its burrows. Although a mammal, it lays soft-shelled eggs, from which are hatched the curious naked babies. Unlike the marsupial kangaroo, the platypus, a monotreme, does not have a pouch, but holds her babies to the lower part of her abdomen with her tail. Here they feed upon the mother's milk, which is given off through the special pores in the skin that pass for teats. Both fore and hind feet have strong claws and are webbed, the webbing extending beyond the claws of the fore feet. However, when walking or running, it tucks this projecting swimming membrane under the foot, so that the claws register in the track. On the inner side of the hind leg the male platypus has for defence a hollow horny spur connected with a poison gland. Another member of the strange monotreme family, the spiny echidna, also an egg-layer, is found in this land of left-over animals.

While tracking down Japs in New Guinea, our soldiers may run across the footprint of the New Guinea wild dog, a small black and white animal that looks more like a pet dog than a wild creature. The spiny echidna is also found here, as well as some of the wallabies of the kangaroo family. Here, too, as well as in Australia, lives the dormouse phalanger or opossum mouse, another small marsupial very mouse-like in appearance. These spend the winter months in sleep, and to tide them over they store a great deal of fat in their tails, the base becoming quite a swollen storage pantry. In New Guinea, too, is a black-tailed marsupial cat with a pouch that opens downward, but is visible only during the breeding season.

Sharing honors with the kangaroo on the Coat of Arms of Australia is a large flightless bird known as the emu, the sole living species of the Dromaiidae family. Its large three-toed track is usually found on the Australian plains with others of its tribe, for it likes company. Being unable to fly, it uses its legs most effectively and has been clocked at a speed of thirty to thirty-five miles per hour. The feathers of this strange bird are most unusual, two feathers appearing to spring from a single shaft. This is due to the unusual growth of the after-shaft, which is merely a minute branch in the feathers of most birds. In the emu, however, this after-shaft is as (Continued on page 276)

Nature Hikes—Ugh!

Some new views on the kind of Nature program that clicks in camp

By JAYNE K. BUSCHO

Illustrated by Lawrence D. Conway

CAMP life is the most vital experience of the American child. Can you forget those moonlight dips, those campfires on a sandy beach with a moonbeam shot across the water, or those canoe trips, perhaps berry-picking, or to an overnight camp? Or maybe you saw a bold deer in your flashlight beam as you left the lodge after evening program, or heard a whip-poor-will after taps. Everything about camp was touched by Nature—even the cookout when you took eighteen wood ticks off your slacks.

But your counsellor, Miss Dorothy, called every wood tick a spider; a whip-poor-will, an owl; and could not answer your question about the grass snake at all. "Ask Miss Mabel when we're at camp," was her feeble reply. By the time you reached camp, you were more interested in swimming, and you forgot the snake and Miss Mabel altogether.

Miss Mabel was the Nature counsellor. She took you on Nature hikes—detestable things, unless you ran across a mess of gooseberries; or maybe got you up at 5:00 A. M. to urge you, bleary with sleep, to listen to the birds twit and chirp. Yes, you disliked this, and so do ninety per cent of the campers at the average camp. Yet that is the type of Nature program usually found.

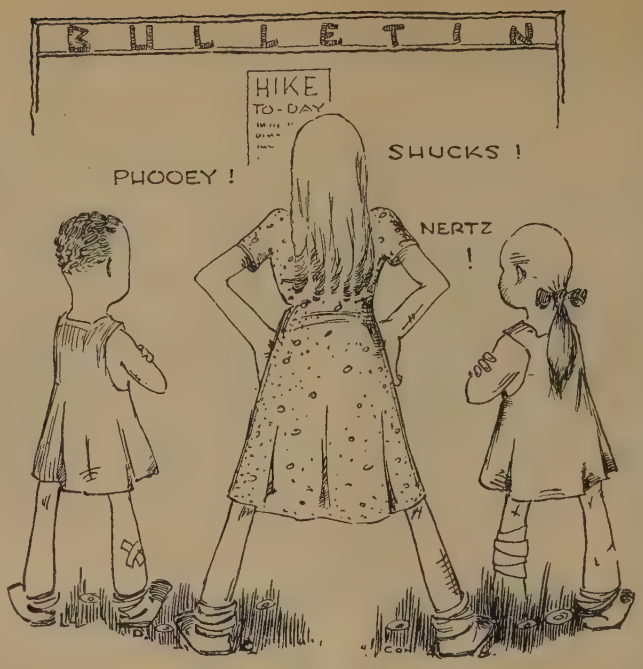
What is wrong? Nature permeates camp, furnishes the setting for all your memories; all the good times. Camp *is* Nature, embellished with a little equipment and a few good friends. So our whole Nature program must be reorganized, becoming the center of camp rather than a schoolroom class of innumerable facts, tactlessly presented and almost completely unaccepted. We want every camper, above all, to learn to like Nature, and, if possible, to have every camper become acquainted with the common trees and flowers near camp, and the interesting animals that invade camp.

Our aim is to reach, not three, four, or six campers as we are now doing, but *all* campers. We find that all persons, young and old, are to a varying degree curious about Nature, although they may not even know it. We find that usually when we attempt to satisfy that curiosity with the announcement of a general Nature hike, "ugh!" passes the lips of nearly all campers. So Nature hikes, as such, are *out*.

Yet the Miss Mabels are not. They know a great deal about Nature and are indispensable at camp, but their role should be a little different. Before camp opens the counsellors will be on hand. The Nature counsellor should give them a concentrated training in Nature, teaching them to identify as much of the local flora and fauna as possible in the brief time available; giving them interesting highlights concerning them. The counsellors are adults, and capable of fact-cramming. We must assume, also, that they have the qualities of leadership and an alert eye that enables them to see interesting things and call them informally to the attention of the campers. These counsellors, then, become responsible for answering the questions of the campers, and for pointing out on a canoe trip or a breakfast hike some interesting little object of Nature, like arrowhead, or a spittle bug. This arouses curiosity and the trip soon becomes a spontaneous Nature hike. It is better that Miss Dorothy rather than Miss Mabel answer the general questions anyway. There will probably be ten of her, and, in addition, her answers should be informal, with more scientific detail to come from Miss Ma-

bel at the proper moment.

The second part of the Nature counsellor's role is to establish and maintain some sort of Nature nook at camp. It should be near the center of camp, and should not be a dusty and cluttered museum where accumulations are kept year after year. It should start fresh, except for important specimens and collections, and can be a place where campers can bring a butterfly, or a turtle, or a skull, or a fern; where insect nets and mounting material are kept; where a few simple guides are easily accessible. In this Nature center, the Nature counsellor helps the collectors, and, with the aid of a few campers, arranges and cares for objects brought in.



Her third duty is to initiate the interest in Nature as tactfully and cleverly as possible. For young campers, competition, or the game angle, shunned as it is, is always a starter. For example, at lunch some noon, everyone who eats must bring three kinds of tree leaves and identify them. Or, perhaps, their ticket shall be one or two flowers (knowing and avoiding the species needing protection), which they shall name. Then these may be used for table bouquets. A Nature contest is fun and does not have to be elaborate. Post a list of the campers on the front of the Nature nook, and award points for what they can identify. These may be brought to the nook or named where they are found—five points for a snake or bullfrog, three for a frog, one for a leaf, flower, or puffball.

Simple prizes may be given, or the winners named at a Nature-nook open house at sandwich time some afternoon. Tickets to this open house might be the results of a Nature scavenger hunt, teams consisting of small groups of girls. A Nature column in the camp paper may serve to create amusement and curiosity.

There are so many simple schemes for creating interest in Nature, but the older the camper the harder it becomes. The best Nature program for older campers probably will consist of the plants and animals tactfully pointed out on canoe trips, overnight hikes, breakfast hikes, or treasure hunts. Star-gazing, fire-building, and outdoor cooking are channels where love of Nature may be developed. Whatever the program, it should never be forced or boring, never be the morning-afternoon Nature class variety, for then our whole aim is defeated. Better nothing at all than to create dislike for knowing the outdoors.

Just as camp is a vital experience, Nature must be a vital experience for campers. Concentrated Nature in any form, while fine and efficient for adults, is not the best policy for most youngsters. If they learn few or no names at all, but learn the thrill of being able to handle a garter snake, or eating blueberries and juneberries that they recognize, or of choosing the best kind of wood for the type of fire they wish—slow burning oak or crackling pine—they will be far better conditioned to an enjoyment of Nature, more likely to conserve it, and much more interested in going forward with concentrated interest in the future.

★

Wee Neighbor

By CLAFLIN KEYES

Oh, joyous burst of melody!
How can so small a throat
Pour forth such gladsome symphony
On balmy air to float!

A very waterfall of sound,
How liquid are its tones!
Where else on earth is such joy found?
Oh, never upon thrones!

It is a glorious thing to know
Such ecstasy can be,
And scattered where each breeze can blow
It forth to you and me.

You gurgling cascade of delight,
It's love that swells your breast
And speeds your swift and frequent flight
To babies in your nest.

You tiny feathered happiness,
You gladden the world of men,
When you fill it with your blithesomeness,
You miracle of a wren!

Young Swainson hawk practicing with its wings on the nest and about ready to fly. This was the last picture taken in the splendid series by Mr. Bradt and his wife. The first pictorial records were made on May 17 and this last one was recorded on July 26.

All in the Life of a Swainson Hawk

By GEORGE McCLELLAN BRADT

Spring comes early to the deserts and mountains of western Texas. But long before the sudden and ephemeral vernal showers have inspired dust-green vegetation to new and miraculous growth, birds are building secret nests. From the middle of March onward, innumerable desert birds sing and mate, brood and rear their young.

More fortunate than many a fellow soldier now far from home, I was able to spend my off-duty hours exploring Fort Bliss' desertic environs for the nests of southwestern birds. Finally, on May seventeenth, my wife and I discovered the nest for which we had been especially hunting—that of *Buteo swainsoni*, the Swainson hawk.

Of all our western hawks few are more completely beneficial or more worth our gratitude than the Swainson. During the long hot hours of the desert day these magnificent winged-hunters war upon man's rodent and insect enemies. Yet poor myopic, prejudice-ridden man at every opportunity slaughters not only the Swainsons but all the other fast-decreasing and irreplaceable birds of prey—our hawk, owl and eagle allies.

The solitary yucca in which our Swainsons had built their platform-like nest of coarse twigs stood on a great stretch of rolling desert. Close together on the dry twigs lay three greenish-white, faintly-marked eggs. Too readily do the Swainsons abandon a disturbed nest, so, after taking a few quick photographs of nest and eggs we withdrew to a distant rise to watch the parent bird's return. Soon, beating low over the sparse ground-cover of cactus, agave and creosote, the adult flew straight to the nest and settled herself upon it. Fervently we hoped that ours were the only eyes that thus observed her.

During the next two months we found that a weekly visit was sufficient to record the progress of the nest's occupants, and yet not often enough to frighten them.

On May twenty-fourth we made our second visit. The single brooding adult again disappeared into the desert distance, but we caught a fleeting glimpse of the extensive unmarked buffy areas on the under sides of its wings so characteristic of the Swainson, and, with the help of a long lens, got a fair shot of her departure. We found the eggs still unhatched, so spent the short time we dared remain measuring the height of the yucca, and noting that from a vantage point, some twelve feet above the desert floor, the incubating hawk could see—and herself

A parent Swainson hawk flies from the nest on the approach of the Bradts and its departure is recorded with the aid of a telephoto lens. Above, three of the greenish-white, faintly-marked eggs of this hawk. Since the birds were likely to abandon a disturbed nest the photographs were quickly made and the adult allowed to return to her eggs.

remain unseen—for several miles in every direction.

May thirty-first, our third Sunday, was claimed by the Army, so hawk and nest and eggs were spared our spying, but June seventh found us again on the way to the distant nest. Not far from the nest we ran into a blinding cloudburst. Coming opposite the yucca we could barely see the sitting parent bird protecting its precious contents from the chilling rain. So heavy was the driving downpour that even a moment's exposure would have meant disaster, so we are still wondering whether or not the eggs had hatched by this date. It seems quite certain that the great event took place no more than a day or two before or after that drenching afternoon.

June fourteenth finally arrived and we rushed off to the nest-site full of eager anticipation. All being well, we knew we should find in it something a bit more exciting than three eggs. When we came within sight of the yucca we began searching for signs of life. Soon we could make out an adult bird standing on the nest-edge apparently pulling at something with its strong beak. When the bird saw us it flew from the nest with an ear-piercing scream, and instead of disappearing as heretofore, remained to circle high above us, emitting shrill cries all the while. These actions were unmistakably those of a hawk with young in its nest. Climbing to the roof of the car, we found staring at us with beady eyes two tiny white hawklets. In the nest with these fuzzy babies were parts of a cottontail rabbit and of a young pack rat. It was this food that the parent had been tearing as we approached.

After getting a good look at the little fellows and trying unsuccessfully to imagine the fate of the third egg, we set up the ladder and our cameras and photographed the weak and hungry fledglings. Feeling quite certain that the nest would not be deserted now that it contained helpless young, we stayed longer than usual. Apparently we stayed too long, because ten minutes after our arrival both adults, seen together for the first time, began taking turns diving at us. Although they never actually struck us they did fly close enough for their swift wings to whistle only a few inches above our heads. Finally we left, the adults no doubt believing that they had driven us off.

On the twenty-first of June we returned to find the two young birds considerably larger but still too weak to stand. We again photographed them from our insecure position on ladder and car, while the parents either perched on low yuccas and screamed at us, or practiced pulling out of power dives close to our heads.

Sunday afternoon, June twenty-eighth, was a sad one for both the parent Swainsons and for us. When we drew up under the nest only one little white head and one pair of beady eyes peered over the nest-edge at us below. What could have befallen its nest-fellow? Would not a

Above, young Swainsons about a week old and still weak. Note the partially-eaten cottontail rabbit in the nest. Below, two young Swainsons about fourteen days old. They were still unable to stand but they were good models. Their little crops bulged with cottontail. The little hawks were too sleepy to worry and dozed in the hot sun. Note the dead green-and-white lizard in the nest. The upper picture was taken on June 14 and the lower one on June 21.

The visit on June 28 revealed one remaining young hawk. The fate of the other two was unknown. This bird was able to stand and a few black quills showed in its wings. After the Bradts had finished photographing and were driving away they looked back to see the little ghost-like bird watching their departure. In the blue sky high above wheeled the screaming parents.

Mrs. Bradt holds the young bird, shown in the nest above, to show its relative size. The little fellow was furious at this attention and as soon as the picture was taken it was returned to the nest, in which its only companion was a partially-devoured rabbit. This picture also shows well the black wing quills that had developed by June 28.

hungry enemy have taken both nestlings? Had it died and been removed by the adults. *Quien sabe?* But whatever the fate of its "brother" the one remaining bird had grown and changed remarkably. Now strong and well able to stand, it had even acquired a few black quills in its wings and in a day or two would have some poking through its ludicrous tail. When we climbed the ladder to get its picture it quickly spread one wing, clenched its yellow feet and hurled at us what was undoubtedly meant to be a defiant scream, but was really a feeble wail.

July fifth was our seventh hawk-Sunday. We found the one remaining nestling finally beginning to look like a hawk. Although retaining much of its natal fuzz it now had many chocolate-brown, buffy-edged feathers on wings and back and even a few in its short tail. It stood well, could tear its own food, and occasionally would stretch wings or legs as if in the throes of "growing pains". We took a few pictures of the appealing hawklet before turning our attention to the adults, which for so many weeks had gone almost unobserved, so intent had we been on the young birds.

The parents had remained all that July fifth afternoon

The partially-feathered nestling photographed on July 5. It was probably at least four weeks old at this time. Its head was still clothed in its downy skull cap, but a few dark feathers were beginning to poke through. It was by this time a little more than half-grown.

A week later, on July 12, the youngster was found to be well-feathered and with its tail almost one-half grown out. The hawk had little fear of its visitors and seemed to be concerned about nothing except the hot summer sun beating down upon its partially-feathered head.

gliding through the desert air above our heads with their sharp eyes ever focused on the nest and us. Both were beautiful specimens, almost identical in color, size and markings. Their wing-spread was probably a bit more than four feet, while their dark, grayish-brown bodies were hardly more than twenty inches long. The immaculate white throats of both sexes gave way to a broad pectoral band, chestnut-colored in the male, grayer in the female. Both had light gray tails crossed with nine or ten dusky bands. These two adults must have been at least three years old since true adult plumage is not worn until the third feather-suit is acquired. Immature birds are almost completely brown, except for the white chin, buffy under sides of wings, and tawny, drop-marked breast and belly feathers. In the hand the wings of the Swainsons have the three outer primaries cut out or indented on the inner webs near the tips. Even immature birds will not be confused with the red-tailed hawks, no matter what the plumage, if this one fact is remembered, for the latter birds have four primaries so notched.

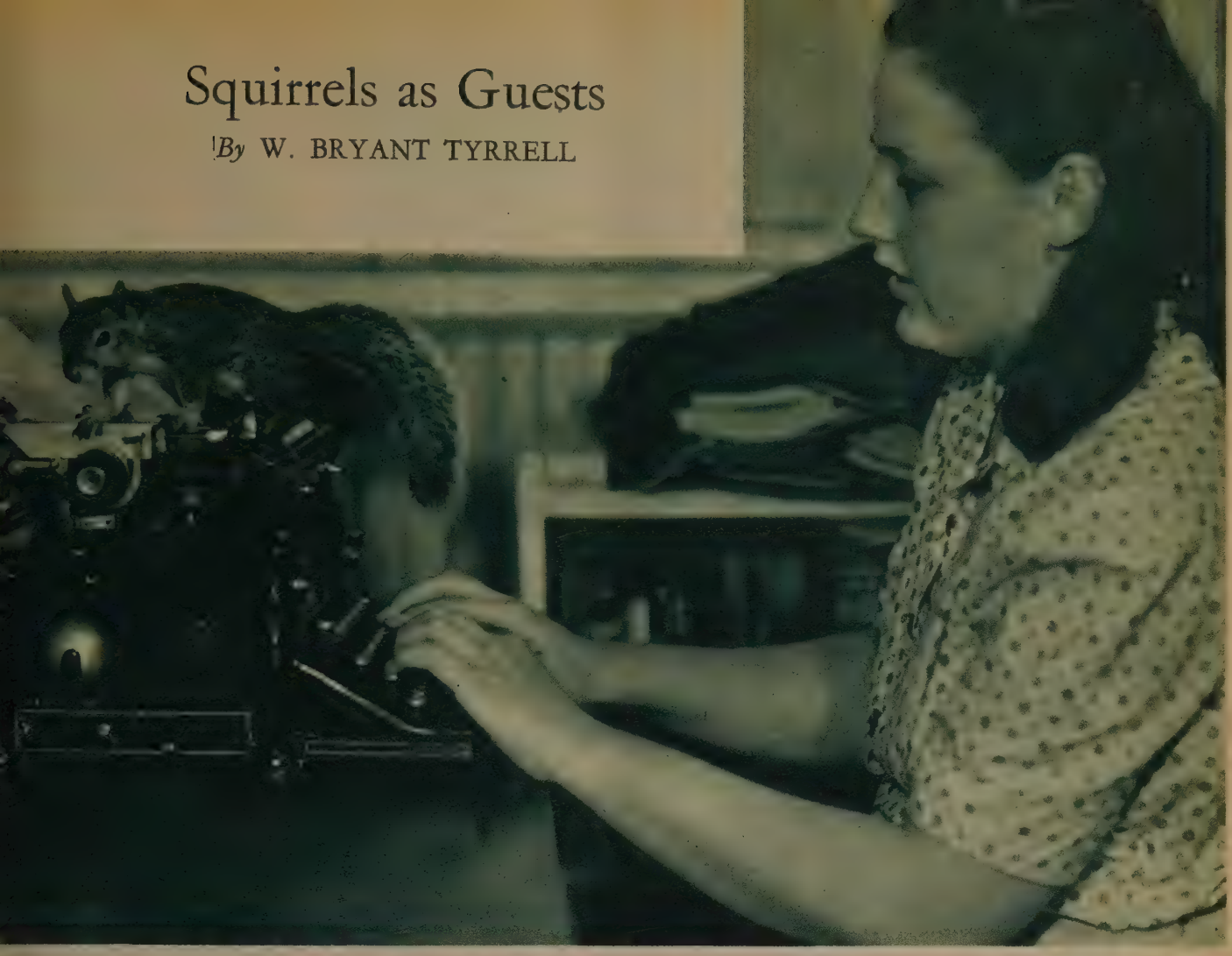
On July twelfth we found the young bird so large and so well-fledged that we hesitated before approaching the nest. We feared that the bird, perhaps by now able to fly, might take off and leave its nest before it was ready. When first seen it was lying down on the nest, but when it saw us it stood up to watch our approach with its large, dark-gray eyes. We "shot" a few pictures of the hot and hungry fellow and then left to visit occupied mocking-bird and thrasher nests not far distant. The fact that both these nests had young in them caused us to wonder why such easy and toothsome morsels had not long before fallen prey to our pair of Swainsons—so popularly and so erroneously called "chicken- or hen-hawk". Each time we had visited the hawk nest not a dead bird—nor even a feather—had been found, although there were numerous nests close by that contained unprotected young. Cottontails, lizards and wood rats formed the Swainsons' diet as far as could be determined from our observations. *Food Habits of Common Hawks*, by W. L. McAtee, confirms us with the statement: "Swainson's Hawk, eminently a destroyer of ground squirrels and pocket gophers, and of grasshoppers and crickets, thoroughly deserves considerate treatment at the hands of man."

The July nineteenth afternoon marked the end of our hawk-Sundays. In a very few days the young hawk would leave nest and parents to lead its own life in the great sun-drenched desert. Never again would it have to endure man's presence, no matter how sympathetic. It would be as free as is anything in Nature, and concerned with little except getting enough food to satisfy its voracious appetite. Soon it would forget the two strange creatures that peered at it over the nest's edge Sunday after Sunday.

An adult Swainson hawk in second-year plumage. The adult Swainsons are impressive in their graceful beauty. Fortunate indeed were those who have seen groups of five hundred to two thousand in migration. It breeds from northern Canada and Alaska to middle Mexico, and winters south of the Equator, mainly in Argentina.

Squirrels as Guests

By W. BRYANT TYRRELL



Those who feed wild birds often find squirrels a pest. They need not be. Ever since knowing Scamper, who is here seen interfering with the business of typing, and is getting a scolding—which will do not a bit of good—we have enjoyed him and his friends. We will admit that when his pals get too numerous, and there are more than eight around the yard, it is well to trap some and transfer them to a park.

Having squirrels around and at the same time feeding the birds is a matter of ingenuity and hospitality. The ingenuity is reflected in the way in which bird feeding trays are built and placed to give the birds monopoly. Hospitality comes with provision of a special feeding place—always kept well stocked—for the squirrels. A hungry squirrel is very clever in finding out how to get at food set out for the birds, but if he has a place of his own much of the temptation is removed.

Two squirrels invade the bird-feeding station. This, however, could be protected by placing a funnel-shaped metal collar, turned downward, around the post about eighteen inches below the bottom of the feeder.

Another device to assure the bird feeder being for the birds is the trolley feeder. This should be suspended from a number eight wire—not cord or rope because squirrels can run on these easily. This wire can run between two trees, or tree and house, and should be more than twenty feet long. Squirrels can usually make a ten-foot jump successfully.

If squirrels are provided with a feeding station of their own, and this is kept liberally stocked with sunflower seeds, peanuts, bread crumbs and bits of fruit, competition with the birds will be much less. Such a feeding place is shown below, and they have it to themselves except for the bluejays, who are continually fighting with the rightful patrons. It is an amusing contest to watch. Expense of providing squirrel rations may be kept down by saving watermelon, cantaloupe, pumpkin, squash and other seeds during the summer, cleaning them and washing them in a sieve, and putting them away to dry.

As We See It

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Wildlife and Wishful Thinking

"Look for more emphasis on wild animals as food. Stories of great increases in wild game animals will burgeon. Emphasis will be placed on damage to agricultural crops by wildlife. Object: To obtain release of sporting ammunition by WPB; thus enabling gunners to go afield; buy licenses; maintain administrative status quo."

In some such fashion "inside dope" sheets and analyses of national trends might describe what is going on. Typical of what the public is being fed is *Time Magazine*'s report of the session of the eighth North American Wildlife Conference held in Denver. Under a heading "Go and Get It", *Time* reports that "food-rationed U.S. citizens last week heard mouth-watering news. A great over-abundance of U.S. wildlife, largely due to the war's curtailment of hunting, was reported . . ."

This is either deliberate misrepresentation, straining after sensationalism, or just plain poor reporting. The Wildlife Conference met for three days. The wildlife situation was discussed from many points of view. The probable results of little or no hunting in 1943, and the present game bird and mammal supply, were only two of many subjects considered. Yet the report of *Time* gives the impression that during a 1942 season of only slightly lessened hunting-pressure wild game suddenly became impossibly prolific. "Great over-abundance" is ridiculous, as wildlife administrators will promptly tell you.

Time marches on to say: "The wild duck population is thought to be the heaviest in years, is making farmers angrier by turning crop lands into 'picnic grounds' ".

There were cases, during 1942, of crop damage due to concentrations of migratory waterfowl. There always have been. These situations the Fish and Wildlife Service met through supervised control measures. They may have to meet more serious ones in 1943. But in prejudiced quarters these problems are being magnified to create the impression that the condition is nation-wide. Corollary: restrictions should be lifted.

"Quail and rabbit in some parts of the U.S. are threats to crops, gardens," says *Time*. So quail, those greedy eaters of noxious insects, are now damaging crops! Before, we have heard this wail mainly from Ohio gunners, whose beauty sleep is so often disturbed by the thought that Bobwhite is still on the songbird list in their State.

"Yellowstone Park's two elk herds, thinned by 7230 during the present winter, are still a problem." They are, indeed, but the National Park Service has met the situation realistically, reducing the surplus by systematic reduction to the carrying capacity of the range, preventing waste, and providing an example of how such problems should be met.

"Wyoming's rising moose population is mooching down on civilization in search of food," asserts *Time*, galloping on. It will take a long war before Wyoming's moose herd gets to be a real menace to anything.

"The conservationists' remedy for the surpluses," *Time* tells us, "is as plain as the nose on a moose's face; let the government release a modest amount of ammunition to hunters (dealers' shelves are now bone-bare). They point out that such hunting is not only necessary to maintain wildlife population at an optimum level, but also taps a potential food supply of more that one-quarter billion pounds of meat—plus feathers, fat and fun."

So *Time* starts its report with an over-abundance assertion and winds up with emphasis on wildlife as a vital factor in the food supply. Both emphases are distortion of facts, and dangerous to the future of North American wildlife. They will be seized upon by that considerable segment of the gunning population that do not wish their sport interfered with. These statements will give an erroneous impression to the general public, awaken unjustified hopes, and stimulate unsuppliable demands. They will weaken the lock on the door that has been closed on the commercialization of game by conservationists and all good sportsmen. That door must not be opened.

Lifting of hunting pressure, or a virtual closed season in many sections by force of circumstances, will, no doubt, create some wildlife problems of economic

significance. These should be met by game administrators, both Federal and State, and not by journalistic hysterics and sensationalism.

It is true that sporting ammunition has not been manufactured for nearly a year. Except for an undetermined amount in the hands of retailers and gunners, none is available. Many gunners will have to stay home and worry about the war and taxes, which may be tough on their morale. But there is a war on, and gunning for the enemy comes first.

On the other hand, many species of game birds and mammals have been seriously reduced. Some are gone. Recent years have seen a generally successful program of building up stocks of some wildlife species while continuing the shooting of most species. In the case of only a few species, and then only locally, have we had too much wildlife. Less hunting and wise hunting for the duration will unquestionably speed the recovery of many reduced species. In any cases of overabundance, the surplus can be removed in a properly-supervised fashion.

There is, of course, one problem created by no gunning that is not usually openly discussed. Wildlife belongs to the State, and, therefore, to all the people. Yet we have created a system whereby game administration is supported by the gunner through licenses, and through such devices as the Duck Stamp and the Pittman-Robertson Law. Licenses support the State game commissions; the duck license levy supports in part the Federal refuge program; the Pittman-Robertson Law diverts the tax on sporting arms and ammunition to wildlife projects.

Under such a system, if no licenses are purchased, no stamps are bought, no ammunition is available, the props are knocked right out from under the program. This proves our contention that wildlife, being the property of all the people, should be controlled, restored, aided, and otherwise administered by the use of public funds. It is only natural that administrative officials should, under the circumstances, be greatly concerned both about their programs and their jobs. It is equally natural that they grasp at any straw to find a means of maintaining the status quo. Perhaps, however, present conditions might provide a golden opportunity to shift the burden of caring for our wildlife where it belongs—to all the people.

★

Birds' Nests

By SALLIE ARNOLD

Where birds build nests to raise their young,
No sweeter songs were ever sung;
So happy working all the day,
For little ones to hatch in May.

★

The Great Chain of Being

By WILLARD HALLAM BONNER

THERE are fundamentally two ways man may look at Nature. In one he perceives the things of beauty that are a joy forever and his heart stirs with yearnings toward goodness and God. Stones have sermons, birds have wisdom, and a sum of things is forever speaking. This might be called the emotional or imaginative way.

The other is a clear-headed attempt for man to see himself as he really is in relation to all other things; some greater, some less, than he. He is wise enough to see his place and to keep it. This might be called the way of reason. Each is an antidote to the extreme of the other.

Alexander Pope, the poet of good sense and reason, saw the universe as a great chain, a vast scale ascending from microscopic things toward God.

Mark how it mounts to man's imperial race
From the green myriads in the peopled grass.

He notes the mole's dim eyesight and the lynx's keen; the deaf fish and the musically sensitive birds; the spider's exquisite touch and the bee's olfactory subtlety; the unreasoning swine and the half-reasoning elephant.

Or again, he turns things around and looks down the scale.

Vast chain of being! which from God began
Nature's ethereal, human, angel, man,
Beast, bird, fish, insect whom no eye can see,
From thee to nothing.

All these are "alike essential to th'amazing whole", of which Nature is the body "and God the soul." Pope's *mind* tells him this, whereas Keats and Wordsworth emotionally and intuitively *feel* it. Even what we cannot perceive, says the poet of reason, is but Nature's art. All discord is but "harmony not understood," and "all partial evil" is but "universal good." Inevitably, one truth emerges: "Whatever is, is right."

Nature in Print

By HOWARD ZAHNISER

"If I were imprisoned for life, though allowed freedom during one week every year, I know that I would choose the first week of May," says Raymond Tifft Fuller in his newly published volume on outdoor explorations entitled *Now That We Have To Walk*. Appropriately enough, the suggestion is for this issue of Nature Magazine as seasonal as Mr. Fuller's title is timely. One feature of the book is a journal kept by the author in his New York State home during the first week of May in 1942. Hermit thrushes singing in migration, showy orchis in bloom, the first red bat of the season, and a large wave of myrtle warblers passing through, are among the fortunate observations of the May Day journal—a May First that began at 6 a.m. with five deer walking past the long woodpile, and ended with the recollection of five loons that flew over at lunch time with their loud but mellow calls. It was a day that included a search for a great-horned owl nest during which Mr. Fuller "came upon a barred owl nest, which, climbing revealed, held three little fuzzy yellow infants." It was indeed a day to prove Mr. Fuller's faith, and the six that followed it are as recorded in this journal of a week only added proofs, unto the perfect number.

To prove and "to propagandize the faith, our faith," are, in fact, the candidly avowed aims of Mr. Fuller—aims that he is conscious of sharing with a growing number of outdoor writers, writers for whom he senses a propagandizing mission. "Having discovered a sort of salvation, or assurance in the heart of nature; in the true, the beautiful, the vital elements of the pulsating world we live in; a kind of nepenthe in walking, looking, listening, studying; having found so much for ourselves, we, like Calvin," Mr. Fuller testifies, "can not choose but exhort."

"And what we are doing," he writes after mature reflection, "turns out to be trying to maintain the morale of all those who resist and oppose America's overpowering cult of materialism and its high esteem of wealth."

It is interesting that, by the chance coincidence of publication dates, I should receive Mr. Fuller's book at the same time as John C. Merriam's latest volume, so similar in many respects as may be perceived from the descriptive title that he has chosen for it: *The Garment of God: Influence of Nature in Human Experience.*

"The mission of those who have sought the sources of human value in contemplation of nature," says Dr. Merriam, "represents one of the great quests of all time." Dr. Merriam himself joins in this quest with emotions unsubdued by his intellect's experience as a modern scientist. "In the light of modern knowledge the wonder and power and beauty of the world are not less," he declares, and the virtue of understatement clothes these words for the reader who has enjoyed the whole of this volume—a book in which a scientist writes not only of various aspects of Nature in logical fashion but also in a personal mood of "Our View of Nature as Broadened by Science" and of "Impressive Natural Features." These are somewhat matter-of-fact titles for writings that are inspired and personalized in a most satisfying way. Near his home in Washington, D. C., Dr. Merriam has enjoyed the "impressive natural feature" that he calls the beeches of Adams Mill Road, and he makes them significant for all of us. "Street-car lines and streams of automobiles converge and diverge under the guidance of unseen hands behind the traffic signals. . . . Two blocks distant the grateful shade of a quiet grove brings the peace of nature."

Other types of inspirational influence Dr. Merriam illustrates with his descriptions of the Lake Region of England as seen by Wordsworth, the Grand Canyon of the Colorado, Crater Lake, the redwoods of California, and the coming of spring. With less of the scientist's logic but with more of the enthusiast's infectiousness Mr. Fuller has gathered into his volume a collection of many essays on subjects almost as diversified as the experiences an outdoors walker can expect. From them he derives no logical statement of the influences of Nature, but out of them arises the impression that Mr. Fuller is indeed right in his mission and right also in foreseeing many benefits for us, "now that we have to walk." He includes a chapter called "Longest Trail in the World," an essay on the Appalachian Trail; another called "Knee-Deep in Marsh;" and still others called "Snake Facts," "Animal Infants," "America's Gamest Game Bird," "Wild Language," and "Humility Before Bees." These, of course, are only examples. There are many others—nineteen chapters in all, not to mention the many poems that are quoted, and the lists of other reading matter cited.

The Garment of God and *Now That We Have To Walk* are both timely in the sense of fitting in with our inclinations and opportunities of the present—Dr. Merriam's book as a contemplative essay, Mr. Fuller's as a sample case of the observations a layman can make. And these observations may also be of more than the passing interest of a walker. (Continued on page 274)

We have learned so much about their care that we can now say—

Azaleas for Everyone!

By ANDREW S. WING

McFarland Photographs

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The azalea border is a most effective use of these lovely broad-leaved evergreens, which serve the garden all the year and whose glorious blooms, although brief, hold promise for another year.

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TIME was when only those living in certain favored regions could grow azaleas, rhododendrons, mountain laurel, andromedas, blueberries, bearberries, and the other broad-leaved evergreens. Unless the soil was naturally acid, the rainfall fairly regular, and the winters moderate, it was thought foolhardy to try to grow these plants. Now we know better. The favored region myth has been exploded, and it is mainly a case of properly pampering our broad-leaved pets to get the best results with them.

Experiments at the Missouri Botanical Garden, and the experiences of many gardeners living west of the Allegheny Mountains and north of the Ohio River, prove that it is not essential to live in an acid-soil region, or a mild climate, to grow azaleas successfully. Doctoring soil to make it suited for the broad-leaved plants is, also, a fairly simple matter. While climate is a hurdle that can not be cleared entirely, we are learning that by providing a proper local environment for plants we can keep them healthy and blooming in regions that were formerly considered too hot, too cold, or too dry for them. There is much we still do not know about the limits, west and north, beyond which it is not safe to try to grow these plants, but we are learning about that too.

So far as soil is concerned the technique of growing the lime-haters is about as simple and as standardized as the method of growing a fine bed of roses. Unless you have a naturally fine soil, you have to excavate a foot or two to make your rose bed. That is as deep as you need to go for azaleas, and they are not so subject to bugs and blights as are roses. So once your azalea bed is established about all you have to do is to keep it mulched, do a bit of pruning, and water it faithfully in dry weather.

April or early autumn are the best times to transplant the broadleaves. With azaleas (azaleas are rhododendrons, you know, and the same directions apply for all acid-lovers) you prepare the soil a little differently than for roses, but it is no more trouble or expense. Azaleas like a sandy soil full of organic matter, and definitely acid—testing a pH of 4.5 to 5.2. The sand used should be siliceous *not* of limestone origin. The organic matter may be peat moss, compost, leaf mold, sawdust, or well-rotted manure. If adding a third by volume of organic matter does not make the soil acid enough, a light sprinkling of aluminum sulphate—one pound to each large plant—should do the trick.

If your plants come balled and bagged, as they should, line the hole with about two inches of the humus mixture, and then mulch with two inches more on top. Water well to settle the ball in the hole and to fill up all air pockets. If the humus used is fairly fresh and not well decomposed, the addition of some nitrogen is advisable in the form of cottonseed meal, bone meal, ammonium sulphate, or even a complete fertilizer. Be careful to keep it away from the roots. This is because organic matter, in rotting down, absorbs nitrogen at the same time it is generating acidity.

From then on all you need to do every year is to mulch with oak leaves, peat moss, sawdust or some other acid-forming organic matter. Since rainfall al-

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One would almost be willing to be a bird to be able to take a bath in such a setting as this one, surrounded by the beauty of azaleas.

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ways leaches downward, it does not matter how much lime there is in the subsoil. Azaleas and their kin are all shallow-rooted. Never cultivate them. It is the top-soil and the mulch that count, not what is twenty inches or more underneath. Rhododendrons grow wild in limestone cliffs in China. Their roots do not absorb the lime as they have established themselves in a thin layer of leafmold that rests on the rock. In Kentucky and other limestone regions where the bed rock is close to the surface, the top soil is often acid and must be limed to grow clover.

The latest addition to the list of humus-forming substances is sawdust. An Ohio uncle taught me this trick. He uses it in heavy clay soils when setting out evergreens and other trees. Sawdust does a good job of making humus where the roots need it. Sawdust, of course, contains little plant food, but for that matter neither do peat and the other forms of humus. These substances are valuable mainly for their aerating effect in heavy soils, for their organic matter, and for their acidifying action. Sawdust has all these advantages and the further one of being both available and cheap in most parts of the country. Driving through New England, I saw hundreds of sawmills, each with its huge heap of sawdust—a gold mine for plantsmen if they but knew it!

Since then I have found references to the use of sawdust in a number of books and bulletins. It has been used successfully for some time in North Carolina, in New York State and in Ohio. Oak sawdust is probably best, but even pine and cypress sawdust have been used. The more acid it is the better, of course, for our purpose. The older and the rottener the sawdust heap, the better. I have even seen it used as a mulch for lilies at Geneva, New York—a limestone region.

So much for the soil treatment. You will not have any trouble working that out if you follow the principles laid down here. Rhododendrons have been growing happily and blooming in limestone soil at Rochester, New York, for thirty years. And that city is not any Palm Beach in winter, either.

This brings up the question of climate, a factor that is even more important than soil. There are indications that the range in which azaleas and rhododendrons can withstand cold winters and hot summers is much wider than we formerly supposed. These plants vary a great deal in their hardiness. Some can withstand the arctic cold of high mountains; others can stand the heat of the South but not much freezing. Azaleas grow naturally in the Appalachians and on up into New England. They also grow wild in the Ozarks. But the fine hybrids of the old gardens in Charleston and the deep South are tender even in the highlands of North Carolina. However, there are a number of varieties of azaleas, rhododendrons and the other broadleaves that are quite frost resistant.

At Grosse Ile, Michigan, near Detroit, Mrs. Melvina M. Angell is growing both native and hybrid azaleas

and rhododendrons. She uses acid sand, peat moss, compost and an acid fertilizer. Her plants bloom beautifully, according to Ruth Mosher Place in the Detroit *News*. Although Mrs. Angell lost most of her roses last winter, not a single azalea or rhododendron winterkilled. She insists that these gorgeous plants can be made to thrive under proper conditions in Michigan.

Michigan is in Zone V, if you will look at your climatic map. That takes in northern Missouri, north-central Illinois, northern Indiana, most of Pennsylvania except the Philadelphia region. It then slants on up through northern Connecticut and Massachusetts into Maine. There are lots of good varieties that are hardy in Zone V, with some allowances for local conditions.

Zone VI holds a storehouse of treasures, including some of the very finest of the broad-leaved evergreens. But in Zone IV the choice is much more limited. That takes in southern Iowa, and from there on up through southern Wisconsin into northern Michigan and across central New England.

The farther west you go, the harder it will probably be to succeed with these plants because of the hot burning summer winds and the tough winters. When we come to the Pacific Coast area, some of it is ideally suited to the broadleaves. They grow wild in western Oregon and Washington adding glory to the landscape.

When it comes to varieties, you will need to do some checking, first with catalogs, then with your local nurseryman, or with other gardeners who have tried them in your community. Mountain laurel is the queen of our own natives where it will grow. It is hardy in Zone IV and does well in Ohio. Next to that, try the Mollis, or Chinese, hybrid azaleas, which have hairy stems and will withstand drought. They come in beautiful shades of yellow and red. At St. Louis the *Azalea japonica* hybrids have proved tolerant of the hot summers and limy soils.

There are a good many rhododendrons that are resistant to cold, but go a little slow until you find out how they will stand hot summers. The lovely arbutus bush, *Abelia grandiflora*, should be in every garden where it will grow. So should the andromedas, and the bearberry. Heather is not very hardy, but well worth trying.

Remember that these plants require a cool, moist, but well-drained soil, full of acid organic matter. Give them partial shade, some protection from drying winds, and feed and water them when they need it. Very little pruning or spraying is required. Their insect pests and diseases are few and easily controlled. Give them a happy home—the natural conditions that they like—and they will grow and bloom for you for many years to come, a perennial delight in the home planting.

Night Piece for A Southern Garden

By MARION EDITH SMITH

Across the south the warm and muted night
Is hovering on gossamer gray wings.
The land is moon-strange to the watcher's sight,
Bewitched, enchanted, loud with murmurings.
And in the garden ghostly flowers grow:
A rose turns silver on its thorny stem;
Tall poppies single-file walk down the row
And crowds of larkspur stand aside for them;
The daisy nods above its slender spear
And foxgloves take a sacrament of dew.
The night is spilling earth-cool shadows here
On Canterbury bells and feverfew.

And in the quiet pool one willow tree
Reflects a tumbling fountain filigree.

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Borrowed Clothes

By WILLARD HALLAM BONNER

One of the dominant ideas in all of Shakespeare is Nature. What is unnatural is wrong. Whatever harmonizes with Nature is right. The thing that seems to worry the ghost of Hamlet's father most is the *unnaturalness* of the murder—"Most foul, most horrible, most unnatural." King Lear's stony-hearted daughters go against nature, and they turn their proud old father out of the house on a night so stormy that one should take pity on even a ravenous wolf. The wild elements seem to crack the world as Lear's heart and mind crack. Amidst the violence and bitterness and triple madness of this play appears the notion that man has tricked himself out in a splendid array of things not his own but borrowed from Nature. Man not only depends on Nature for the essentials of food, shelter, and clothing, but gets himself up grandly, lives in splendor, is proud of himself, and takes little thought of those less fortunate than he. Actually he needs but very little, and even that little is really borrowed temporarily.

Old King Lear goes mad from mental and physical suffering out in the fields swept by a terrific thunderstorm—Nature in the raw. His cracking mind is, however, still clear enough to see that man is but a child of Nature and that he, the King, is just beginning to learn (too late) this important fact. He has never discovered the real, essential King Lear. He craves to be himself, solely and completely. So he shouts, "Off, off you lendings," and he tears off his clothes. Naked, he defies the elements, only to go completely mad and collapse. Then sleep, "the foster-nurse of nature," brings back sanity to a sadder and a much wiser man.

". . . the squirrel had become engrossed with peeling pinyon nuts and was sitting up, his bushy tail over his back, his knobby paws stuffing meats into his mouth."

Squirrel of the Golden Forest

By IRENE FINLEY

We were rambling through the Kaibab Forest under the glow cast by big patches of yellow aspens among the dark-green ponderosa pines. The air was fresh and balmy, and this golden forest seemed to be on the top of the world where no one ever came. Yet it was only a few miles to the north rim of the Grand Canyon, and in a mountain valley behind us cattle were grazing.

Out of the stillness above our heads came, "Cluck! Cluck!", followed by an impatient "Chur-r-r-r!" It sounded as though we were trespassers and were being told so. Yet, looking up into the trees, we saw nothing. Only the aspen leaves fluttered in the breeze. Then, among the branches of a pine, we caught a flash of white, and saw, sprawled out on a limb, a big squirrel with his tail rolled over his back. For some minutes there was no movement, then, out-stared, he climbed swiftly up the trunk, his white plume flowing as he went. The last we heard was, "Wuh! Wuh! Wuh!" in a guttural barking. It was the Kaibab squirrel, perhaps the rarest of his kind.

Sciurus kaibabensis was a trim, aggressive individual, dark grayish on the back with an ochrous patch, snow-white underparts even down to his fingers, long, strong hind feet, pointed ears tufted in black, and a big flat tail, pure white underneath and glossy-black on top. To match his clean-cut coloring, he had the bearing of an over-lord of the realm.

In the morning the sun shone through the tall, dark pines about Jacob Lake Lodge, and who should we see but our forest friend scampering about the yard under the trees, his tail carried jauntily over his back

like a white scarf. He walked with a jerky, waddling gait, and when we came too close, he loped away in smooth bounds. When we persisted in following him, he scratched up the trunk of a tree, peered around it with his pointed ears forward, and his black eyes bold. He stamped his feet on the bark and scolded "Wuh! Wuh! Wuh!"

About fifteen miles across the great chasm of the Grand Canyon lives the cousin of the Kaibab squirrel, the Abert, with his all-gray coat, tufted ears lined with orange, and, also, a big white tail. One scientist lays the variation in color of the two squirrels to the change of environment and "isolation, that powerful factor in evolution." Both squirrels are subject to about the same conditions of food and climate. They are the only American squirrels with conspicuous ear tufts.

In winter the Kaibab Forest is buried in snow, but in summer there are everywhere lovely meadows and long aisles through the pines. Deep grass and wild flowers cover the floor. Once it was a remote wilderness where larger animals were found—the cougar, bear, and others—and the wild turkey still roams the hidden nooks. On the plain below this forested ridge, the buffalo feed in wide pastures, and the Navajos still herd their sheep along the dry hillsides and dwindling streams.

The Kaibab squirrel may nest in the hollows of old trees, or he may build a bulky home of twigs, pine needles, and leaves high up in the branches of a pine. He is awake during the whole year, but when the storms strike his region he retires to his warm nest. He may have two litters of from three to four young each season. The seeds and tender bark from young tips of the yellow pine make up most of his diet. Frequently he nips off the ends of the pine limbs, and lets them fall to the ground, then strips the stems for food.

Roaming in the vicinity of the Lodge one day, we found a large wire pen. It had a slanted over-hang and looked like a cage for pets. Small evergreens grew about and there were the skeletons of several trees denuded of bark. A pan of water and an empty food dish were on the ground. Up in one tree was what looked like a bird house. We saw a black nose appear at the entrance—our foxy friend again. This was our third meeting. We stepped inside the gate, closed it, and stood watching. He also watched us with a half-quizzical, half-belligerent expression.

At the store I bought some pinyon nuts while my partner set up a camera. I doubted that the temperamental squirrel would stand still long enough for a picture, especially a colored one, which takes more time. Perhaps he would disdain the bait entirely, but I put some nuts down in front of the camera, anyway.

The diminutive color camera was fixed on the small metal tripod, which was placed low to the ground with its legs spread out. Altogether, it looked like a big black spider ready to spring. The squirrel circled skittishly around it, eyeing us, then came slowly up, his tail dragging at an uncertain angle. He seemed undecided whether to try it or bolt.

The camera man made last adjustments with as few movements as possible, and was ready. By this time, the squirrel had become engrossed with peeling pinyon nuts and was sitting up, his bushy tail over his back, his knobby paws stuffing meats into his mouth. There was dead stillness for an instant; then the shutter clicked. There was a flash of white. Our quarry was gone, and there went eighty-seven cents to the dogs. He was quicker than the camera. We commenced all over and in a few minutes got a black-and-white shot.

Then we changed positions to try for another colored one. When all was ready, I reached my hand out to put some nuts in the branches of a little evergreen tree, when—flash—the timid squirrel flew up like a streak, scratched and bit my hand in half a dozen places. They were deep gouges, and drops of blood rolled off. It was an intentional assault. *Sciurus kaibabensis* was no bluffer, nor did he lack in courage.

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Something's in a Name

By L. C. WHITE

He's been known as English sparrow, quite some while.
We have scorned his feather pattern and his style,
    Called him "bully", and a "pest",
    Roundly cursed his noisy zest,
While reluctantly admitting he has guile.

Now, the scientists announce, his name's all wrong!
He's no sib to chipping sparrow, lark, or song.
    They've re-analyzed his palate's
    Tiny bones, and cast their ballots
For the species where he really should belong.

And it's weaver-bird, black-throated, if you please.
Kin to them that dwell and weave in Afric trees.
    He's no sparrow—not one whit,
    And I'm willing to admit
I can better tolerate his yipping wheeze.

Three Giant Swallow-tails and a Tiger Swallow-tail on azalea. These are not dead butterflies but tame ones that dined on syrup on the author's fingers and drank water cupped behind her fingernails. Photograph by Arthur Gaiser.

Venturing North, the Giant Swallow-tail Butterfly is studied, and its larvae called—

Fifth Column Cats

By EDNA PECK ATWOOD

A BLOODLESS invasion is going on unheeded. Singly and silently, scouting fliers are penetrating the North. Not from overseas, not from space, but from our own Dixie they come. Yankees, awake! Man the *nets!*

But be calm. The metaphors of our time are misleading. The invaders merely plot naturalization. They desire to be all-American. As enemies these fifth columnists are something of a false alarm. True, each flier bears a cross-bow on his back, but it is only an imitation, as harmless as it is antiquated. True, each flier is a giant, but only a Giant Swallow-tail Butterfly, unlikely *ever* to become a pest, because of food-faddism in infancy—the larval state. Life awing is brief. His race moves northward by relayed generations. Nature herself pushes him back toward the starting point every time he trusts, in a long warm fall, to advance himself another generation. He is slow to learn that to hatch late in Yankeeland is to die without issue.

In his native South, a Giant baby feeds commonly on citrus foliage. In my northern garden he eats gas plants. These diverse host plants have a joint link—kinship. They belong to the great Rutaceae family that has about one hundred and eleven genera and nearly eight hundred species. It would be interesting to know if all members of the Rutaceae harbor Giant larvae.

Let us start at the beginning. In late September of 1939, a bevy of girls brought me twin caterpillars new to our locality. Unlike their grandmothers, modern girls fail to scream at sight of a crawler, however hideous. Instead they must learn its name and future state. Thus through youthful interest came the tip that *Papilio cresphontes,* the Giant Swallow-tail, was extending his latitude. These larvae were orange-

dogs, strayed, unlicensed, far from the orange groves. Given the name, the girls gave me the dogs. I evaded dog tax by renaming them "gas-cats" as more fitting to gas-plant-eating *cat*erpillars. Their food was no problem at all. My garden boasted five luxuriant gas plants, known also as fraxinella and dittany. These plants made me suddenly, independently rich.

The "gas-cats" deserved discovery. They had the outsize forebodies and the willful bad odor characteristic of swallow-tail larvae. Alarm ejects the two horn-shaped scent pouches just back of the head wrong side out, broadcasting a memorable stench. These are decidedly red and, of course, retractile. Nature does not outlaw concealed weapons. But swallow-tail cats soon class their attendant as a harmless bogy and withhold their punishment. Humorless and nearsighted, they miss the fun in their keeper's unfailing recoil, anyway.

The "gas-cats" were about one and one-half inches long and were approaching the maturity that follows the fourth molt. They had saddles and pillions of greenish-white, and areas of white behind their shining brown heads. Some purple-blue dots came clear under a lens. Surmounting their enlarged thoracic segments was the form of a shield, sketchily outlined with circlets and bearing among vague spots a modified star design—a coat of arms of sorts. Their camouflage-arrangement of brown and white gave no concealment when they chose to crawl on green foliage.

". . . staring . . . from the anal shield was the climax—the lifelike face of a dog, no feature missing, sober, enigmatic of eye."

For three years an occasional Giant butterfly had visited my late zinnias. Over his black wings lay the golden cross-bow; under them stretched gold leaf. I knew the thrill of the chase and the chagrin of the empty net. But it is not fun to kill a butterfly! To touch his elusive gold with an admiring finger would have satisfied. Some day a female might arrive in time to found a family. I would be apprised of it when I saw Giants in June.

Now their caterpillar cousin, the Tiger, spans his home leaf with a tangible carpet. His foothold of silk is necessary. I wondered if Giant needs were similar. No silk was noticeable, but a lens revealed it in dainty curlycues of lacework fixed to the leaves where the Giants took their ease. Evidently *Papilio* cats, skimped in the number of claws on their fleshy feet, offset the lack with silk grip-lines—an example of adaptation.

After five days of normal feeding the Giants were a bit more than two inches long. Then fasting and protracted quietude warned that the chrysalis stage was near. I must make sketches at once. Blocking out an enlargement, I began to reproduce the pattern exactly. But to my astonishment a "find the faces" puzzle was stretched down the cat's back! Disbelieving, I looked again. There was no mistake. I studied the other cat. He was a duplicate with only minor variations. I was in a *real* Wonderland as strange as that *invented* for Alice. It was peopled with elves—mischievous ones who designed caterpillar costumes. And the faces! Some were plain, some shadowy—a goat with horns and whiskers, a monkey with narrow-spaced eyes, a horned owl. Did not the largest face have the pointed ears of a faun, or maybe it was the first portrait of a *gremlin*. What was another but a model of some Indian medicine man's ceremonial mask! Surely these elfin artists were steeped in world-wide fact and classic fancy! Then, staring at me from the anal shield was the climax—the lifelike face of a dog, no feature missing, sober, enigmatic of eye. A *dog?* And I dub a caterpillar a *cat!* What an anomaly! Does this face lend a semblance of sense to the name "orange-dog"? Here is frustration for a bully of cats. Forever tailing a calm cat, this dog is unable to set the pace. He cannot even bark at his enemy. No wonder he is sober, like the typical butt of a joke.

Working in continued amazement, I finished the drawing, and barely in time. The Giant cat ended his bodily preparations for metamorphosis with the discharge of liquid and membrane-lining of his digestive tract, and without any change in color such as affects many species, including the Tiger to which we compare him. Wanderlust mounted his saddle. Prescience held to his pillion. He was off under their gentle but resistless compulsion; off for his rendezvous with fate. Finding his twin blocking his way, he gave a password or yielded pasture rights or something, for the bodily contact that had always been taboo was suddenly tolerated. Up and over and off that other living totem-pole he lumbered unopposed. But nothing could make him hurry. Indolence had always been his. Languor robbed him of the individuality a Tiger displays. I assume that ages under a tropic sun have filched the energy of his race, or perhaps he saves it for his tireless wings. I caged him. The following day his brother traveled. Neither milled long in his cell but soon came to a sensible standstill. They hung themselves after long deliberation and in darkness. I am unable to say how many hours passed before they shed the clown garment and became chrysalids. I know it exceeded twenty-four hours.

Giant chrysalids are as chesty as pouter pigeons. At first they are a lovely pale gray with whitish areas that suggest bark and lichens. Then they darken a little and are even less conspicuous. In this helpless stage they need and have effective camouflage. Hop-

ing that I had both sexes, I put them away in cool, moist storage to sleep from early October until spring.

Winter passed and lilacs bloomed again. I brought the precious chrysalids to a warm room. They hatched in about thirty-six hours, and at night. One had a wing spread of four and eleven-sixteenths inches and the other four and one-half. They were of the same sex. Dreams of butterfly farming faded. I freed them. One revisited my garden twice during the day. After that I never saw either again.

There were other disappointments. Each of two Tiger chrysalids produced its natural enemy, a wasp-like parasitic fly. In the garden a wren entered the bluebird house, punctured the eggs, and tossed them to earth. Acquaintance with misfortune makes us sensible to good.

Time passed. It was August 17 when I took my weeding outfit to the west border and began work. All summer, without result, I had watched for Giants and for eggs on the gas plants that grew there. Certainly it was odd that on that day of days I should have been at hand. Certainly a benevolent Creator favored my interest in creation. I went to empty a basket of weeds on the compost pile and returned to see, in breathless wonder, a Giantess in the act of egg-laying. She deposited six or seven eggs on different leaflets or on stems. She circled. She winged daintily to another plant and repeated the performance. She rose and drifted airily away toward other gardens, but returned at intervals to mine. She seemed much larger than the June gentlemen. I decided to catch her. She stayed away so long that I gave her up; then a kind neighbor called: "Your butterfly is back". And, yes, I was able to take her unhurt from the net, very carefully, with a thumb and finger each side of her quivering body and with her wings held shut. I measured them so, allowing one-fourth inch for body width. She was a full five inches across. Released, she made off directly but did not shun my garden for long. The next day she was egg-laying again. One leaflet had five of the dull-orange globules.

"They had saddles and pillions of greenish-white..."

"And the faces! . . . a goat with horns and whiskers, a monkey with narrow-spaced eyes, a horned owl."

Meanwhile I had taken some sprays with eggs into the house to time their development and to insure their safety. Precocious, they hatched in three days. (Tiger eggs of my experience have hatched in six to eight days.) However, some of the eggs left outside hatched in six days, some in nine days, and the last took two weeks. The slow eggs endured one degree of frost and all the "gas-cats" left outside succumbed to repeated frosts. Those sheltered made a success of life, although one that was twice frosted grew to only one and one-half inches before he considered himself mature. He had had enough of the North. Twice he wandered from the leaves that frost had drained of succulence. About the time when I began to worry about him, he solved his difficulty and mine by changing into my final chrysalis on October 9. Yet warm weather continued intermittently for some time. One chrysalis hatched. Just as cold came to stay, two others reached the stage of development in which wing markings are visible through chrysalis walls. These two never hatched. Nature's late October warmth was a kiss of betrayal. Before they successfully infiltrate the North, Giants must set their hatching schedules to time as well as temperature. The Tiger knows the secret. But we fear the process will take long.

But we move too fast and too far. We end the story in the middle. Tricking the reader who scans a first and then a last paragraph, we abandon three-day hatchlings. Let us return to duty. Shell-eating was their first act. While they ate their envelopes, I magnified their one-eighth inch tapering bodies. They had wee yellowish areas at head, middle and tail. Contrary to Tiger formula, these spots were to increase and whiten, not decrease and disappear. The balance of their bodies was to be color-fast brown through life. They had double rows of setae-tipped tubercles,

like wee Tigers, but their largest tubercles, also just behind their heads, stood out horn-like at a much wider angle. They grew and molted in six days. All but the fifth-and-last mask molts separate from the skin, so it was easy to pick up a mask on a needle point and put it under the lens of the microscope that magnified sixty-five times. But it was not so easily kept there. I had finally to don a mask myself, for my softest breath blew the infinitesimal thing away three times. It had been lost but for a background of white tablecloth. What a mask! Six eye-mounds gleamed like jewels on each cheek, vertical mandibles gaped, and "goatee" spinnerets trailed a kink of silk.

By the time the cats matured I had many, many masks in four sizes. I have seen molting cats bite and discard masks of horny chitin that had just fallen from their heads. After recovering from molt-exhaustion a cat eats his cast skin. It looks neither palatable nor inviting to me, but if I purloin it the cat is nonplussed for a time with a riddle in defeated instinct. I watch him and feel as if I had stolen a child's candy. A newly-molted Giant cat has a pale greenish head, "collar", and true legs, but they soon turn brown.

Often when I brought fresh food for the cats, I found that I had also collected more Giant eggs or tiny larvae. That was their good fortune and chance of survival. Some of the cats ate more and grew faster than others of the same hatching date. Altogether I had many sizes at once. As they grew and shed their successive skins, setae and tubercles diminished and disappeared completely. My best specimens became two and one-fifth inches long. Their skin at last took on the texture of suede. With the fourth molt came all the oddities of design that challenge language and imagination. None of my cats lacked his dog and the false faces. Every one was sponsor to fantasy and mirth.

Shown these Giant cats, folk looked first amused and then dumfounded. Such an incredible pattern! Chance could hardly produce it on every Giant's fifth skin. From out the stolid materialist's eyes there peeped man's eternal, tongue-tied mysticism. Here was a new conception of the Creator and a reason to look furtively for fairies all the rest of one's life. I translate the cryptogram borne by "fifth column" cats into

A Brief for Laughter

I celebrate a caterpillar gown,
The fifth one any Giant cat will wear
Just before he manufactures wings
And is a Swallow-tail as free as air.

It would appear that elfin art was lent
The Giant with his elemental lack;
For he was made with all the fun left out
And elves conspired to put it on his back.

Their gentle mischief waits discovery—
Their totem-pole array of painted masks,
Their dog-caboose a-tailing every cat
With biteless, barkless dog that mutely asks
Your understanding of his impotence.

Come, read the cipher and your joy renew:
When humor has gone out of you, my friend,
Just wear it outside, as the Giants do.

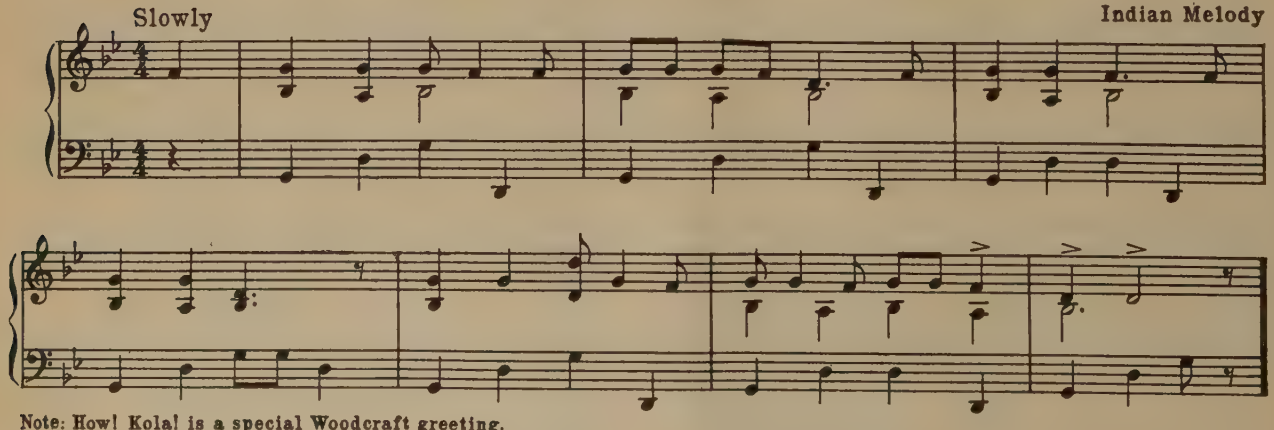
And, maybe, if you cloak yourself in cheer
The while you go on doing sober things,
In God's good time, all Giant-like you'll find
A parallel—a miracle of wings.

★

How! Kola!

Words and music by GRACE KEIR

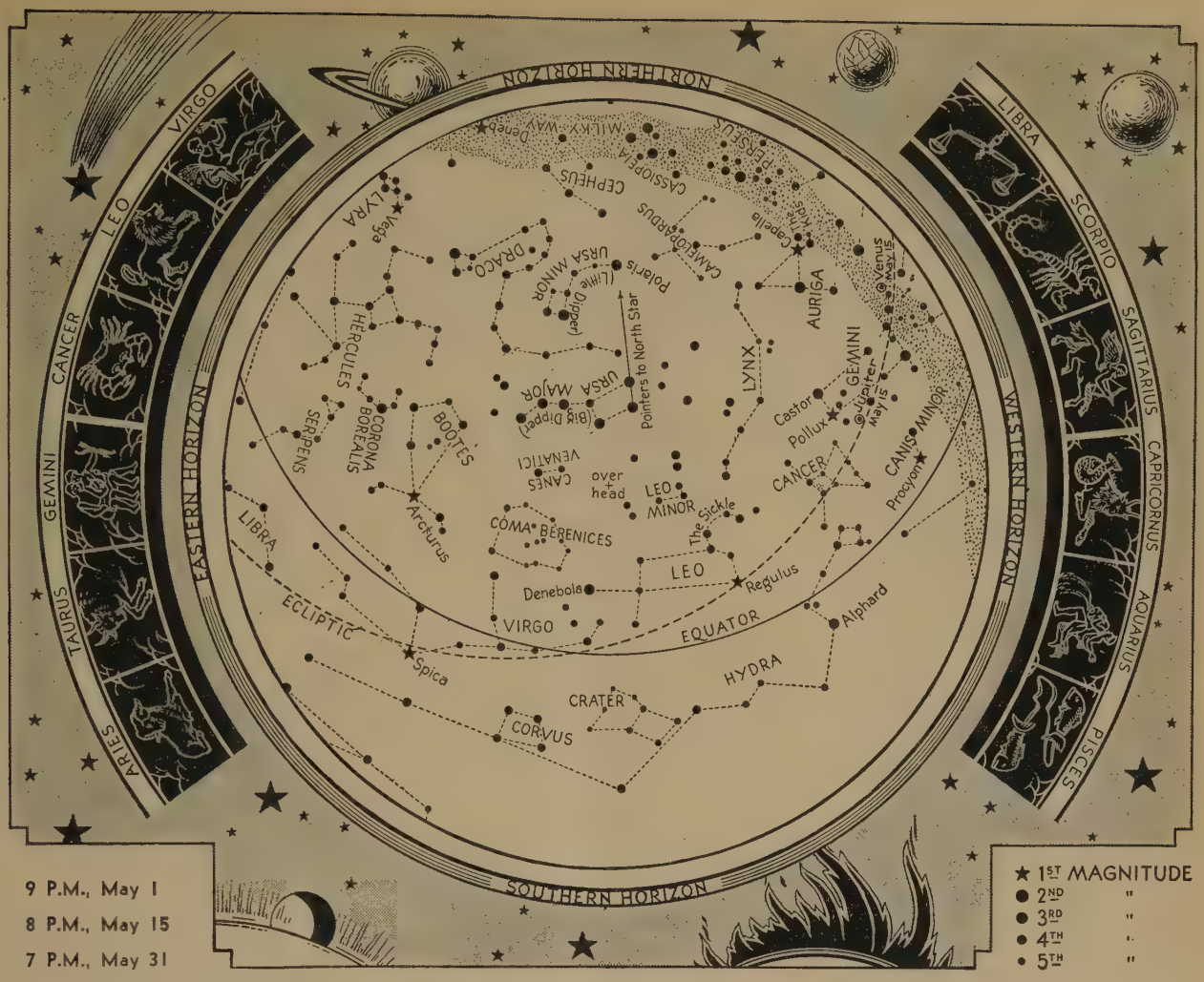
Reproduced from "Songs of the Open" by special arrangement with the publishers, Carl Fischer, Inc.



Note: How! Kola! is a special Woodcraft greeting.

O'er cool smooth water
O'er water cool and smooth,
I see you skate
With your six legs.
Water-skater!
I see you!
I greet you,
How! Kola!

Black, shiny beetle—
You beetle, shiny black,
You whirl about,
You dive from sight.
Diving-beetle!
I see you!
I greet you,
How! Kola!



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then, below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south. Time given is Standard Time; add one hour for War Time.

The Phases of Venus

By ISABEL M. LEWIS

VENUS and Mercury, whose orbits lie inside that of the earth, are the only two planets of the solar system that may, with the aid of a small telescope, be observed to pass through phases like those of the moon. This takes place in the period between conjunction with the sun and the return to their original position with respect to the sun and earth.

During May, and through the summer months into the fall, Venus will pass through phases from that of the gibbous moon through half moon to crescent moon, then from a waning crescent to the phase of new moon at the time of its inferior conjunction with the sun. It will be at that time, in early September, in line with the earth and sun, and between them, and invisible for a short period as it passes from east to west of the sun, and from the evening into the morning sky.

It was in December of last year that Venus passed through the phase of full moon as it came into the position of superior conjunction with the sun. Earth, Sun, and Venus were then in line, with the sun between the earth and Venus, or, in other words, with Venus on the far side of its orbit from the earth. At that time Venus passed from west to east of the sun, or from the morning into the evening sky. For 220 days preceding and following that date—that is from the time when it is at greatest elongation west of the sun in the morning sky until it is at greatest elongation east of the sun in the evening sky—Venus has the phase of the gibbous moon. At the elongations it exhibits the phase of a half-moon, such as the moon has at the first and last quarter. As in the case of the moon, the illuminated side of the surface is that which is

toward the sun—the *eastern* side when the planet is in the morning sky, and the *western* side when it is in the evening sky.

When Venus is in the same phase as the moon shortly before and after it is full—the disk gibbous but almost completely illuminated—it is least brilliant. Also, it is so close to the horizon before sunrise or after sunset, as the case may be, that it is observed under the most unfavorable circumstances from the earth. These were the conditions that existed last December and in January of this year. Now, in May, it is still gibbous, but approaching the phase of the half-moon, which it will attain toward the end of June. As the planet draws gradually nearer to the earth its disk increases rapidly in size, although the illuminated portion of it is becoming less. The result is that the planet continues steadily to become more and more brilliant. It draws gradually farther away from the sun and is higher above the horizon at sunset. Always the most spectacular in appearance of all the planets, it becomes more and more resplendent as the days pass. From now on throughout the summer it will dominate the western sky after sunset. Late in June it will be farthest east of the sun at the time of greatest eastern elongation and its phase will then be that of the moon at first quarter. It will be visible this month for about three hours after sunset. This will increase to about four and one-half hours when it is at greatest elongation.

From now on through the summer it should be possible to see Venus even in broad daylight. It is found east of the sun and at about the same angular distance from the sun that it is from the sunset point on the preceding evening. It will become increasingly easy to find it as it increases in brightness toward the time of its greatest brilliancy on July 31.

After the date of greatest elongation east, near the end of June, Venus passes from the phase of half-moon to that of crescent moon. It is a waning crescent as the planet draws in toward inferior conjunction with the sun. The disk of the planet is increasing rapidly in size as the crescent becomes thinner. It is also still increasing in brightness because the illuminated portion of the planet's surface is increasing in area as the planet comes closer to the earth even though the width of the crescent is decreasing. It can be found by an exact mathematical calculation just when the time of greatest brilliancy will occur. It proves to be about 36 days before and after inferior conjunction. This year it will be brightest on July 31, and the planet will then have a stellar magnitude of minus 4.2, more than six times brighter than its nearest rival, Jupiter, at his best, and even more brilliant than Sirius, brightest of the stars.

At the time of its greatest brilliancy Venus casts a shadow, is visible with ease in daylight, and is two and one-half times brighter than it was near superior conjunction and farthest from the earth.

It will be most interesting, if one can obtain the use of a small telescope, to follow the changing phases of Venus, until, finally, a mere thread of illuminated surface remains visible. Then the planet disappears from view immediately after sunset in the glare of early twilight. Its next appearance will be in the eastern sky close to the horizon immediately before sunrise, and it will again be in the thin crescent phase, only it will now be the eastern instead of the western edge of the planet's disk that is illuminated. This will be about the middle of September. From then on to the end of the year it will pass in turn from crescent phase to half-moon and gibbous phase. Superior conjunction, bringing the phase of full moon, will occur next year, one year and seven months after the planet was last in the same position in its orbit and in the same phase.

It was Galileo who first turned a telescope on Venus and observed that it had phases similar to those of the moon. This was in the year 1610—a great year it was in the annals of observational astronomy. Galileo made one discovery after another as he swept the heavens with his new telescope. Faint stars; nebulas; mountains and other surface features on the moon; the phases of Venus; and, greatest of all, the four satellites of Jupiter; all became visible. It was a bitter blow to those who believed in the old Ptolemaic theory that the earth and not the sun was the center of the planetary system. According to this theory Venus could never show more than half of her illuminated surface, for her orbit must always lie between the earth and sun. When Venus was first seen through Galileo's telescope it was in the gibbous phase. He continued to observe it and saw it gradually change from gibbous through half-moon phase to crescent. Then he put his discovery in the form of an anagram. This was a not unusual procedure with early astronomers who considered they had made some remarkable discovery, and who wished to reserve for themselves the credit, while delaying the announcement until they had made certain of its correctness.

Some months later Galileo supplied the translation to his anagram—*Cynthiae figuras aemulatur Mater Amorum*—The Mother of Loves imitates the phases of Cynthia. In those times Cynthia was a popular expression for the moon, and Mother of Loves for Venus. It was a great day for those who believed in the

But Not the Stars

By JEAN CROSSE HANSEN

Through hate
And frenzied might,
Man has put out
Each light

Within his reach;
But, near or far,
He has not touched
A single star!

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Copernican theory. Here was actual, visual proof that the earth was not the body around which all other bodies revolved.

Mercury, which also shows phases similar to those of Venus and the moon, is more difficult to observe because it is so much nearer to the sun. During the first few days in May, Mercury will be in fine position for observation in the evening sky directly after sunset. It was at greatest eastern elongation on April 30. Jupiter, still in Gemini, is a magnificent object in the northwestern sky throughout the evening hours. Saturn is in Taurus and getting too close to the sun to be seen to advantage. Mars is still quite low in the southeastern sky at sunrise.

Correction

In Herbert Ellison Mitchell's article, "Harmless Snakes as Pets," in our March issue it was stated that with the poisonous snakes "the scales or plates under the tail are in two rows, while in the non-poisonous varieties they are in one row." The facts are reversed, with the exception of the coral snake, which has two rows. As Tojo would say, "So sorry."

Morton Redwood Grove

In its annual report the Save-the-Redwoods League announces the establishment of the Morton Memorial Redwood Grove, preserved in honor of J. Sterling Morton, founder of Arbor Day. The grove has been set aside through gift of a fund by Sterling Morton, Mark Morton, Mrs. Jean Morton Cudahy and Mrs. Caroline Morton. This memorial grove is in the Avenue of the Giants area, below Dyerville, in Humboldt County.

Florida Trees

Common Trees of Florida. (3rd Edition) Tallahassee, Fla. 1943. Florida Forest and Park Service. 98 pages. Illustrated. Free.

This excellent little handbook covers 93 native Florida trees. The first edition was brought out in 1925 and was the work of the late Wilbur R. Mattoon. The two subsequent editions have been brought out by the State Forest and Park Service, testimony to the popularity and value of the publication. The descriptions are popular and usable by anyone interested in trees.

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The School Page

By E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

EDUCATIONAL RESPONSIBILITY

WE know that in other lands much education is more of the ritualistic type than it is in ours. We read with some amusement of some of the superstitions that constitute a major part of what is taught great numbers of children in India. Most of us cannot accept their confidence that the souls of departed human beings reign in the bodies of living domestic and wild animals. We like to be shown. We are not on the same beam with Shintoism and its successors.

Our American philosophy of education has more of the conviction of the idealist behind it than seems to underlie education in the lands under the heels of the Nazis, the Fascists and their ilk. We can, according to our philosophy, rely neither on the spirits of our ancestors nor on the guiding genius of some self-appointed leader. We flatter ourselves that we make our own beds, and lie in them. We are self-made, free, independent and individualistic.

Know the Facts

If this interpretation of the American philosophy is sound, there must, of necessity, be some differences in the way we go about establishing the education of the individual who will be forced to assume responsibilities not shared by citizens of totalitarian countries. We must know the facts involved in a problem we are called upon to solve. We must have experience in evaluating the different aspects of problems. We must recognize that others have rights that should be respected, so far as those rights do not interfere with what is fair for others. We cannot pass the buck to our great-grandfather to the *n*th degree, to the king, or to Adolph. We have to make the decision.

This means that in our school work we must learn not wholly to depend on what the book says, the teacher preaches, or the course of study prescribes. If we have had prejudices against the eating of muskrat, and learn that the flesh of this common mammal is delicious, we should not let our prejudices force us to complain about a meat shortage while we waste an abundance of good meat. If we have been educated to think that the desirable vitamins hide only in the most expensive greens, we should not shut our minds to the fact that the mustard, docks and dandelions that grow along the roadside may have an even higher nutritive value. In a democracy like ours, we cannot permit ourselves to be led about by the nose by the preachments of advertising or the prejudices of our forebears. We are in the saddle. We must do the driving. We must make the decisions.

Many American-born Japanese are at present confined in inland camps remote from our coasts and from strategic military establishments. A biology teacher in one of the schools in one of these communities writes that the first thing the Japanese did was to go about killing all the snakes—of which there were many, and none of which were harmful. The next thing they did was to confine in elaborate cages most of the wildlife they could capture, in spite of the fact that the State laws generally require that species protected by law must not be kept confined during the closed seasons. This particular camp contained only American-born Japanese, only one out of a thousand of whom would volunteer for military service or pledge allegiance to the United States. If this situation is representative, or if it foreshadows in any way the tasks we educators must face in the New World Order that will follow the war, we cannot afford now to let down at all. If thousands of American-born Japanese, living and reared in the midst of our own communities, refuse to recognize the wisdom of such simple things as our game laws, how much greater will be our problem in trying to educate indoctrinated Japanese, Nazis, Fascists and others! If we cannot teach those who have been reared in our midst the importance of wildlife, how can we teach their homefolk to respect the principles of conservation as applied to whales, seals, salmon and sea-otters? Surely, this is no time for Nature educators to rest on their oars.

Individual Responsibility

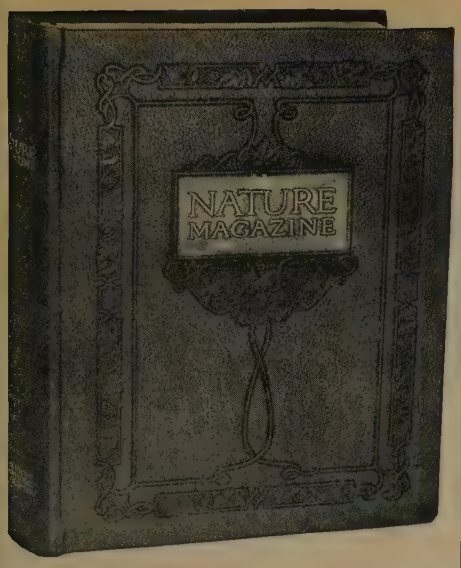
Where the authority and responsibility is remote from the individual—as it obviously is in Japan, Germany and Italy—there is no need for the individual to test the validity of the initial experiences that may modify his convictions. Where that responsibility is with the individual it is highly important that vicarious experiences be avoided as much as possible.

In the February 26 issue of *Science*, Willem Luyten ably takes to task much of the type of education that is being advanced as essential to the nation in time of war. This discussion should be read by all readers of this page. His article, "Air-age Teaching or Misinforming?", shows how faulty are the offerings of what he calls "misinformed amateurs," and he points to the dangers that may arise if we build our science-teaching philosophy on the idea that if a book is published by a big publisher, written by a so-called "big-shot" in education, and uses the term "science" often enough, it is automatically authentic. This sort of philosophy is, in the writer's judgment, wholly out of step with the course that must be followed if we are to help the world towards a rational civilization. One of the authors of one of these books indicates that his book is not so valid as he wishes it might have been because he was forced to meet a dead-line by those sponsoring these official pre-induction courses. So far as the writer can see, the books that are now represented as being an official part of the pre-induction course are fully as valid as a series by the same author for which no dead-line could possibly have existed. If these books have a wide sale and a wide adoption, one can justly question whether America has much more to offer than countries whose general philosophy is so largely unacceptable to us.

Anyone who questions that we are not going to have to be prepared to answer, as individuals, some most important questions based on a rational understanding of Nature need only reflect on a few.

The Freedoms

We advocate freedom of religion, freedom of opportunity, freedom from fear of our neighbors, and so on. What are we going to do when the religions and the national policies of Japan, Italy and Germany advocate increases in population that must of necessity demand in another generation more space in the world



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One thing seems certain to the writer. We can never solve any of these problems satisfactorily by a wholesale acceptance of the authority of others on all matters. If labor passes responsibility on to labor leaders, it loses just that much independence. If Congress passes responsibility to the executive branch of the government, or any branch passes responsibility on to another, independence and strength of the buck passer are lost. So far as is humanly possible we should live real experiences and throw vicarious experiences out of the window, out of our books and out of our school programs. To the extent that we are against vicarious experiences as starting points in our school work, we are laying a sound basis for a worthy membership in world citizenship.

New National Monument

Richly associated with pioneer days, Jackson Hole, Wyoming, has been proclaimed as the Jackson Hole National Monument under the jurisdiction of the National Park Service. Establishment of the Monument makes possible the acceptance of offers to the Federal Government by John D. Rockefeller, Jr. of 32,117 acres of strategic lands within the boundaries of the area. This is a gift to the people and represents the expenditure by the donor of about one and one-half million dollars. The larger part of the Monument was already in Federal ownership, much of it within the public domain or the Teton National Forest. The total area is 221,610 acres. With this gift, Mr. Rockefeller's donations of lands, improvements and other properties to national parks and monuments total more than $13,500,000.

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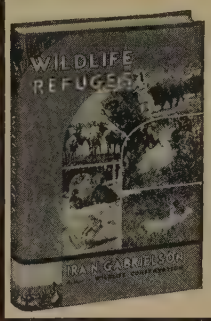

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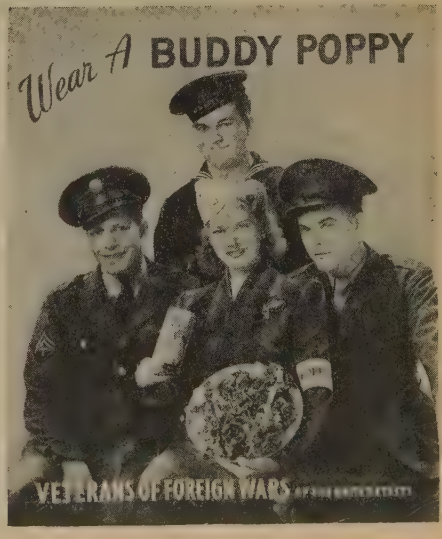


NATURE IN PRINT

(Continued from page 259)

Mr. Fuller's study of the ruffed grouse, as recorded in this work, is something of intrinsic merit and interest to layman and student alike, whether he approaches the hunting season with what Mr. Fuller in another essay calls "a deep visceral dread and a moody resentment," or with the enthusiasm and devotion of a sportsman. Whether we thus sample with Mr. Fuller the experiences of one who goes to the outdoors with the leisure of a man afoot, or whether we contemplate the outdoors with Dr. Merriam, we are convinced that the present is an opportune time for such interests. These are timely interests, because we have no means now for far travel or for fast travel, because we have no time now for the diversions of long vacations, because . . . because indeed our entire perspective has been changed and we are once again looking to the possibilities for enjoyment that are at hand, elemental, and particularly free from dependence on things mechanical —things that require the fuels and lubricants upon which "our civilization is based."

There is, however, a way in which interests in the outdoors are timely in a fundamental sense, timely because pertinent to the efforts that must sooner or later be made to establish peace. This aspect of his interests Dr. Merriam discusses in a chapter entitled "Respect and Love of Nature as a Common Interest of All Peoples." Mr. Fuller also is aware of these world-wide implications of the interests he serves and hopes to share with the world. "I have such a hope," he exclaims, "after hate has at last burned itself out, and we become natural and animal-like!"

"Companionship with nature," writes Dr. Merriam in a paragraph that seems to sum this all up, "results in a better acquaintance with our own personalities—As we see our personal qualities reflected in nature we come to know better what we ourselves are. The result of this acquaintance with ourselves should be enhancement of joy in life, and consequent increase in effectiveness of living. The broader, deeper, and clearer view of the world in which we live, that comes from the suggested acquaintance with nature, means improved understanding of the forces and laws expressed in activities of the world about us. . . . A relation such as has been suggested is unquestionably of the first order of importance to all who wish to have part in an understanding, constructive world movement, such as commends itself to the intelligence of a progressive mankind."

Now That We Have To Walk: Exploring the Out-of-Doors. By Raymond Tifft Fuller. New York: E. P. Dutton & Co., Inc. 1943. 256 pp., with bibliography. $2.50.

The Garment of God: Influence of Nature in Human Experience. By John C. Merriam. New York: Charles Scribner's Sons. 1943. 162 pp. $2.

Insects for Youngsters

Picture Book of Insects. By Albro T. Gaul. New York. 1943. Lothrop, Lee and Shepard. 40 pages. Illustrated. $1.50.

Children start out with curiosity about and not a natural fear of insects. Adults are to blame for inhibiting the young, on the theory that all insects are dangerous and something to be squashed under the heel. Thus many people grow up with an unreasoning fear of "bugs", and are denied one of the most fascinating of interests, the study of insects. This little book seeks to aid in dispelling insect inhibitions by presenting excellent pictures with brief and friendly text. The illustrations—made by the author—are excellent, and each is accompanied by a drawing showing the actual size of the subject, since the pictures are enlarged, many of them very much so. This little book is written for the youngster from eight to twelve.

For Young Herbalists

Spice and Scent. By Lee Maril. New York. 1943. Coward-McCann. 63 pages. Illustrated. $1.75.

Although the publisher regards this as "something new in children's books"—which, indeed, it is—it seems unfair to place it solely in the juvenile category. Any beginner interested in herbs will find it both interesting and helpful, for it is a popular discussion of the history, culture and use of a group of popular herbs. Besides its informational value, the little book is charming physically and pictorially.

Forests and Finance

Forest Economics and Finance. By P. L. Buttrick. New York. 1943. John Wiley and Sons. 484 pages. $4.50.

This is primarily a textbook designed to fill a particular need in the training of the forester. Its first object is to present a unified discussion of the economic and financial aspects of forestry in the light of modern economics. Secondly, it includes material on the economic and financial nature of forest exploitation and on the forest industries. Finally, it weighs the economic significance of protection, recreation and wildlife, now recognized as important in the forestry picture.

New Hampshire Recreation

Public Recreation in New Hampshire. Concord, N. H. 1943. New Hampshire State Planning and Development Commission. 50 pages. Illustrated. 3 separate maps. $1.00.

This is an extremely interesting, attractive and informative publication on the playground aspects of The Granite State. It is a report prepared for the Governor and his Executive Council by the commission that publishes it. The report covers the development of recreational land use in the State; a factual basis for a recreation plan; outstanding problems and needs, and a plan for future development. The result is a comprehensive picture of a state in which recreation is a major industry. The maps in the end pocket show the public and semi-public lands of the State; existing and proposed recreational developments; hiking and canoe trails.

Key to Nests

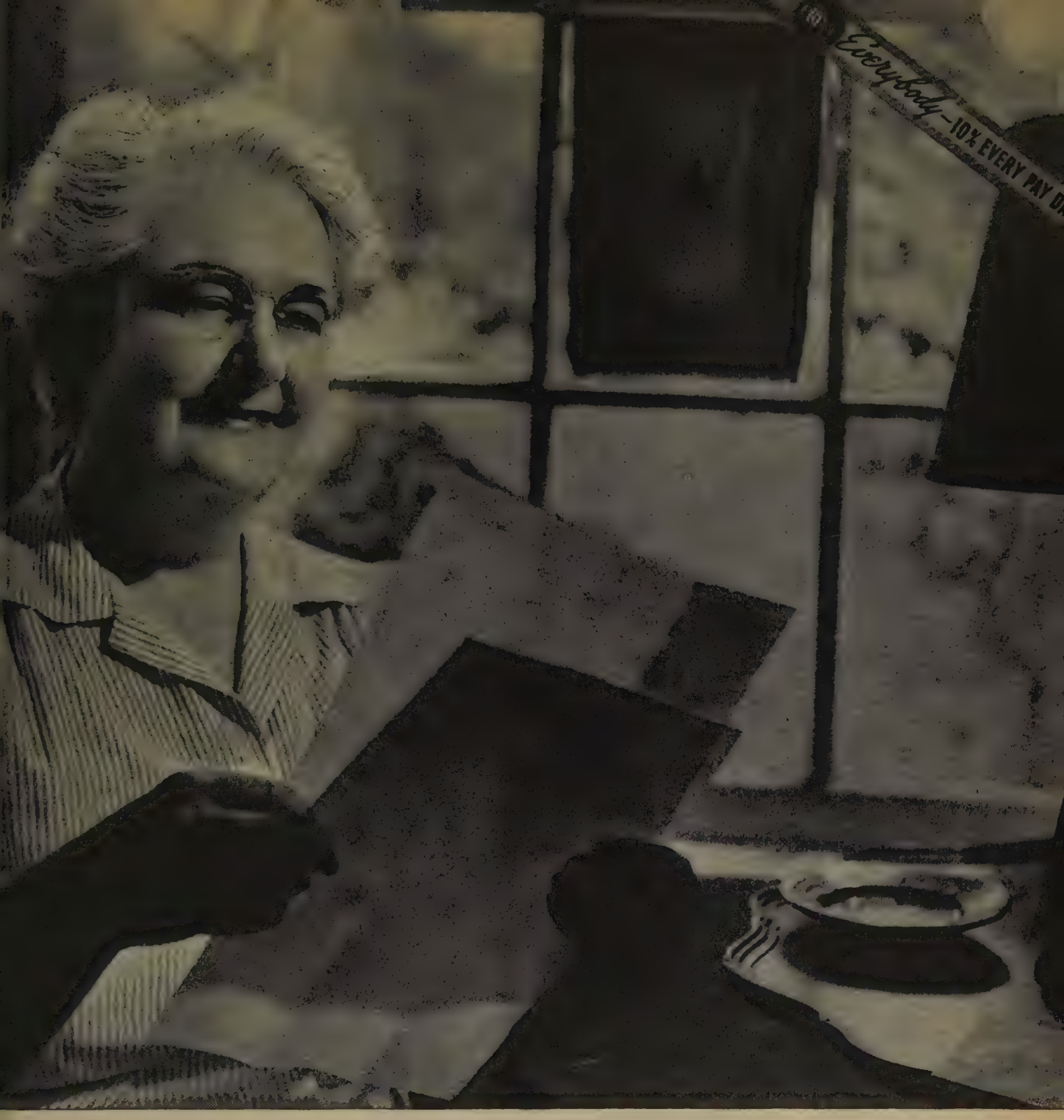
Key to the Nests of Pacific Coast Birds. By Elmo Stevenson. Corvallis, Oregon. 1943. Oregon State College. 71 pages. Illustrated. Fifty cents.

The title of the booklet is descriptive of its contents, which seek to aid the user to a greater knowledge of the homes and home life of birds. The excellent illustrations of the nests are a valuable supplement to the keys provided in the text.

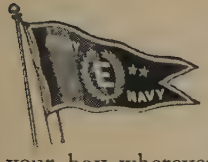
Civic Annual

American Planning and Civic Annual. Edited by Harlean James. Washington, D. C. 1942 American Planning and Civic Association. 254 pages. Illustrated. $3.00.

This valuable annual again records progress in the fields of planning, parks, housing and neighborhood improvement. It is a gathering of material from a variety of sources within the field of the Association that brings it out. It is always valuable for current information and for references.



"Dear Mom...I never felt better in my life"



Isn't it wonderful, Mother, to get a letter like that from your boy wherever he is . . . Iceland, Ireland, Australia, or a camp in the U. S. A.

Remember how you used to worry about his health when he was a little fellow . . . how secure you felt in the house on Greene Street because it was just around the corner from Doc Brown's?

Right now your boy is getting the finest medical care in the world. No matter where he is, he's never farther than "just around the corner" from an army doctor . . . and a mighty good doctor he is, too.

That doctor, as all American doctors are, is armed with the knowledge that has grown out of advanced microscopical research . . . research that was made possible by Bausch & Lomb's introduction of quantity production of quality microscopes.

Today, in every field hospital, and in every base hospital a microscope stands ready to aid your boy's doctors . . . to ferret out the enemy that hides in the water and the air and the insect's sting . . . to aid in the diagnosis of disease.

And out on the battle lines, as on industrial fronts, Bausch & Lomb Instruments are creating winning standards of precision. In your homes, schools and shops, modern eyewear, as prescribed and fitted by men who have made the study of human vision a life's work, continues to do its part for the eyes of a working America.

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TRACKS OUR BOYS MAY SEE

(Continued from page 246)

large as the main shaft of the feather.

And then, if Private Yank dons his seven-league army boots, he may step from the coral strands of tropic seas to the snows and glaciers of an Alaskan wilderness. Here, on the roof of the world, he may find the giant flat-footed tracks, fifteen inches long, of that greatest of living carnivores, the Alaskan brown bear, who sometimes weighs as much as fifteen hundred pounds. He will see there the deeply-worn double-rutted trails made by generations of these giants, as they followed the same routes of travel through the years. In walking, the brown bear's hind foot registers with the front foot and, in spite of his size and weight, claw marks are seldom visible in the track.

Here, too, Johnny Doughboy will find the footprints of another large game animal, the cloven-hoofed tracks of the Alaskan moose. This big fellow may weigh fifteen hundred pounds or more. The hoofs of the bull are usually more blunt than are the cow's. The bull also takes a greater stride and his tracks are farther from the center line. The cow's are more lady-like. When in rut, the bull often drags his feet as do the buck deer.

As regards their tracks, animals may be divided roughly into three groups: those that walk on the flat of their feet, such as man, bears, beaver, porcupine, muskrat, skunk, raccoon, and others; those that walk on their toes like a ballet dancer, such as cats, dogs and other members of their order; and then the group that walk upon their toe nails, to which the hoofed animals belong.

The soldier in Alaska cannot mistake the wide-spreading, crescent-shaped hoofs of the caribou track. These wide-spread hoofs play an important role in the life of the caribou, for by spreading his hoofs widely apart, he is able to walk upon the snow, or on marshy ground, and not sink too deeply. In other words, this type of hoof acts as a sort of snowshoe. In winter the inner section of the hoof is absorbed, leaving sharp edges, by means of which the caribou can safely traverse icy surfaces. In between the hoofs is an inter-digital gland that gives off a distinctive scent, which is left upon the ground as the caribou travels along the trail.

The muskrat is a species that is one of the most widely distributed of American mammals, and his track may be found even in the Alaskan wilds. His trail looks as if he had imbibed too freely, for he seems to weave from side to side, stepping on his own heels as it were. His rat-like dragging tail makes a wavy line in the center of his trail.

The Alaskan porcupine's track looks like a fat, little pigeon-toed Indian's track. In his case the track made by his front foot seems to be covered by that of his flat hind foot. Of course his large climbing claws register very definitely. In winter his trail looks as if some one had dragged a log through the snow, his short-legged body, plowing along, making a trough-like furrow.

An animal that is very much a part of the Northland is the snowshoe rabbit or varying hare. He was dubbed "snowshoes", because in winter he grows very hairy snowshoes on his feet, which enable him to surmount the deep drifts of winter with ease. He has two suits a year, a brown pepper and salt tweed for summer and soft white flannels for winter. He belongs to the ground-dwelling animals who bound. This group place their fore feet in a *diagonal* line behind their hind feet. The tree climbing "bounders" like the squirrel, on the other hand, always pair their fore feet directly behind their hind feet. This is reflected in the tracks of perching and ground birds too. The ground dwellers walk in a straight line, one foot ahead of the other, while the perching bird's feet are paired as he hops.

Thus Johnny Doughboy is turned loose in a veritable Noah's Ark. He will see countless varieties of tracks not even hinted of in this article. To the soldier-explorers it will probably seem as if some super-colossal circus has turned its menageries out to pasture. They will have a collector's-dream opportunity to collect animal autographs of Nature's notables that one cannot find on Times Square, or Hollywood Boulevard.

LIBERTY AND JUSTICE

By Edna H. Evans

Liberty and Justice are not democratic principles. They are a pair of baby turtles. Justice is about the size of a silver dollar, and Liberty is slightly smaller than a fifty-cent piece.

They are two of the hundreds of unfortunate baby turtles that, with brightly but inartistically painted shells, are sold as pets, curiosities, souvenirs and practical jokes. One of the pair was painted orange and the other green, and on each round back was stenciled an American flag and the motto "Liberty and Justice for all."

I found them in a ladies' powder room wash bowl in the recreation hall of one of the largest army induction camps in the country. When I first saw them they were swimming comfortably in an inch or so of water. Now one would scarcely expect to find baby turtles in a ladies' powder room, war or no war. I was puzzled, but I thought perhaps someone might have just parked her pets temporarily.

But, just to make sure, I went back an hour later. The turtles were still there, but someone had run more water into the bowl—hot water. Fortunately it was not very hot—just better than lukewarm. However, the turtles had swum until they were exhausted. Already Liberty, the smaller orange one, had sunk to the bottom where he was still paddling feebly.

Certainly, rescuing a couple of obviously abandoned baby turtles could not be considered stealing. So, when I kissed my soldier husband good-by that night, Liberty and Justice were wrapped in a damp paper towel in my coat pocket.

After a long train ride home, I carefully chipped the paint from their backs and established Liberty and Justice in an aquarium in my biology classroom. My students are learning about turtles by watching them, and their now naturally mottled green and black shells are much more attractive than were their hideous patriotically painted ones.

I want my pupils to learn three things from those baby turtles. First, I want them to appreciate the heartless way those two harmless little creatures were apparently used as a practical joke and then abandoned to die.

Second, I am using them as a protest against the widespread practice of painting living turtle's shells. The paint certainly does not improve on Nature's own good job. Instead, if left on, it will prevent shell growth and soon kill the turtle.

Third, I want my young Americans to respect the American flag and the American motto "Liberty and Justice for all." Symbols like these should not be used as practical jokes, or in a way that inflicts suffering, even though the victims are only baby turtles.

If they win ...only our dead are free

These are our enemies.

They have only one idea—to kill, and kill, and kill, until they conquer the world.

Then, by the whip, the sword and the gallows, they will rule.

No longer will you be free to speak or write your thoughts, to worship God in your own way.

Only our dead will be free. Only the host who will fall before the enemy will know peace.

Civilization will be set back a thousand years.

Make no mistake about it—you cannot think of this as other wars.

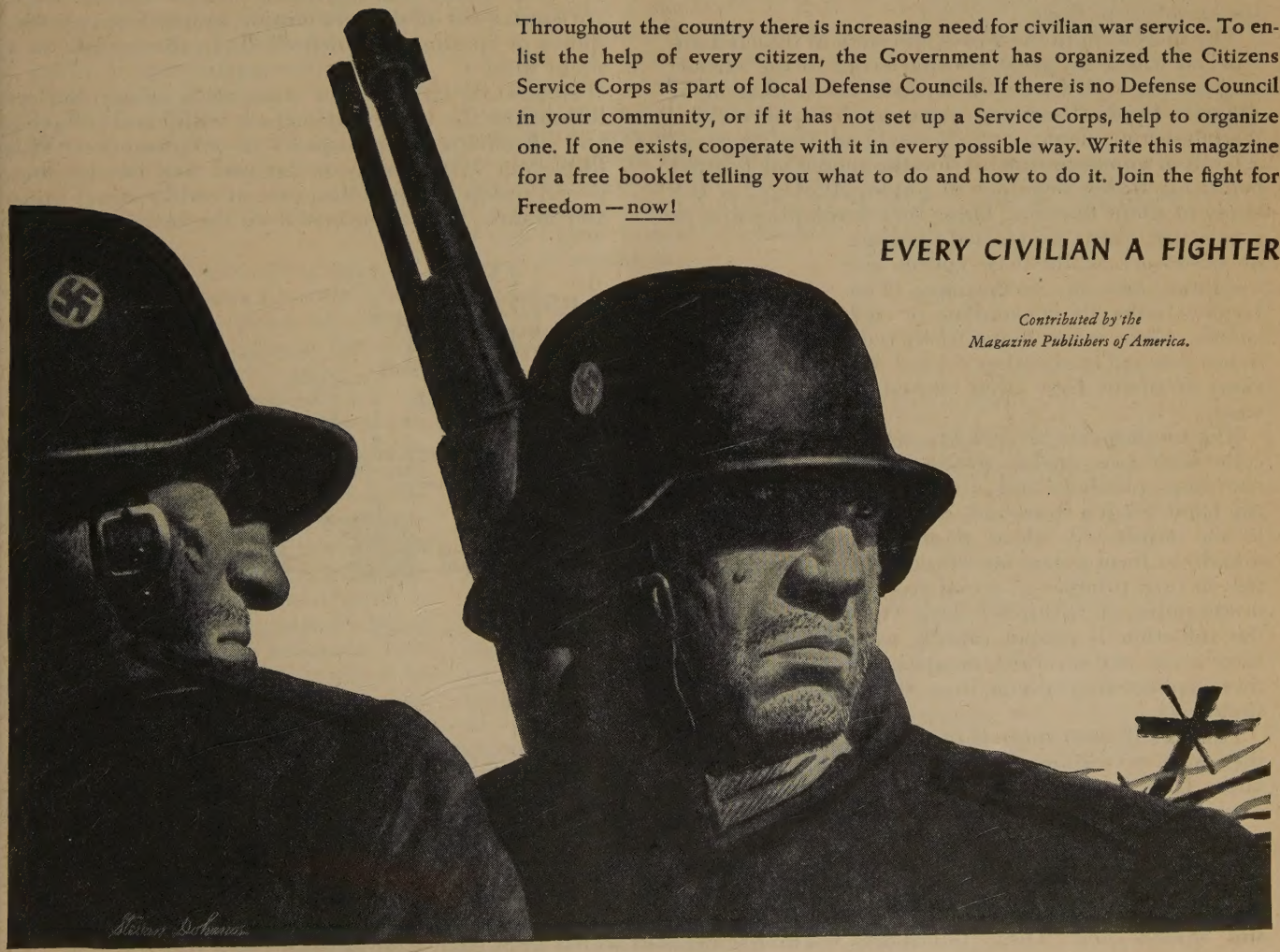
You cannot regard your foe this time simply as people with a wrong idea.

This time you win—or die. This time you get no second chance.

This time you free the world, or else you lose it.

Surely that is worth the best fight of your life

—worth anything that you can give or do.



Throughout the country there is increasing need for civilian war service. To enlist the help of every citizen, the Government has organized the Citizens Service Corps as part of local Defense Councils. If there is no Defense Council in your community, or if it has not set up a Service Corps, help to organize one. If one exists, cooperate with it in every possible way. Write this magazine for a free booklet telling you what to do and how to do it. Join the fight for Freedom—now!

EVERY CIVILIAN A FIGHTER

Contributed by the Magazine Publishers of America.

Under the Microscope

By JULIAN D. CORRINGTON

WHEAT STEM RUST

I. Life Cycle

One of the most complicated of all life histories among plants is that shown by the wheat stem rust, *Puccinia graminis tritici.* The notion that an animal such as the liver fluke could pass one stage of its existence within the tissues of a snail, and another as a liver parasite in a sheep (digenetic or two-host parasite) was strange enough when first unraveled, but the discovery by Anton De Bary in 1864-65 that a plant could also alternate between two hosts was even more difficult to believe. Wheat rust is a fungus and a member of the highest group in this division (Basidiomycetes), with some 20,000 species, characterized by a cottony vegetative structure (mycelium) composed of filaments (hyphae) with cross walls, and by fruiting bodies containing club-shaped mother cells (basidia) that produce basidiospores on their outer walls. Among familiar examples are the rusts and smuts, and the mushrooms and puff-balls. There are nearly 3000 species of rusts alone.

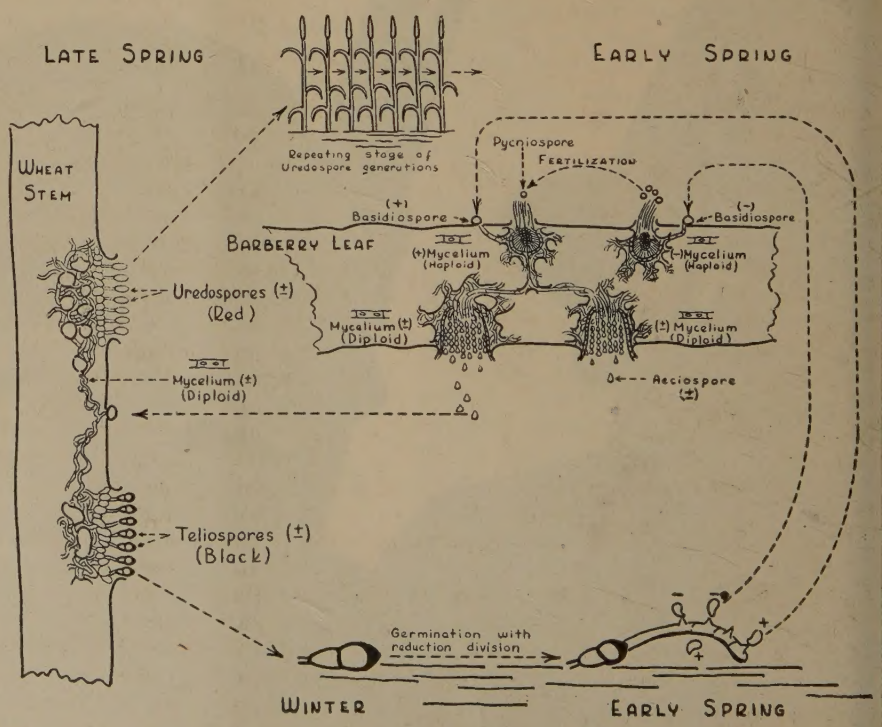
The mycelium in the leaves and stem of infected unripened wheat forms spores that erupt to the surface as pustules, called sori. Since there are a number of different kinds of sori and spores, each has received a distinguishing name, unfortunately of two or more schools of nomenclature, so that the synonymy is often confusing to the beginner in phytopathology, or the study of plant diseases. Those sori developing first in a growing season are termed uredinia or uredosori, while their spores are urediniospores or uredospores. The farmer terms them summer or red spores, their color being rusty-red; hence this and many other related diseases of plants have been classed as rusts.

The uredospores are prickly, single cells with two nuclei, produced in enormous numbers and scattered by the wind. Such a spore may be blown to an uninfected wheat plant, germinate to form a new mycelium, and this in turn produce a second crop of uredospores, all within ten days. Thus the infection is spread rapidly over large areas, and several generations of these spores may occur in a single summer.

Later a different spore is formed by the same mycelium, at first in the same, later in different, sori. In the mass these are black, the infection being then called black stem rust, as if it were a different disease. The sori are dubbed telia or teleutosori, the spores teliospores or teleutospores, two-celled and thick-walled. These teliospores are very resistant to environmental changes and can live through the northern winter among the dead stubble and litter of the field or roadside. Each cell of such a spore is two-nucleate, and cannot itself infect a wheat plant. Instead, it germinates, either one or both of the cells producing a short hypha, the basidium. The two nuclei of a maturing teliospore cell first fuse, the final spore cell being uninucleate. In germinating, this nucleus divides twice to form four and these pass into the basidium which correspondingly divides into four parts with one nucleus to each. Now each of these basidial cells elaborates a short projection, into which passes the nucleus, and which is then cut off as a basidiospore. Two of these spores on each basidium are designated as of plus strain, the other two as minus strain, equivalent to male and female, as we have seen to be the case with sporangia of the bread mold, *Rhizopus* (this Department, Aug.-Sept., 1942).

The basidiospores are blown by the wind to an entirely different sort of host plant, the common barberry, *Berberis vulgaris,* and cannot germinate on wheat. Certain details of what happens next are still in doubt, but apparently the procedure followed is that a basidiospore, germinating on a leaf, stem, or young fruit of a barberry plant, produces a mycelium, with uninucleate cells, that penetrates tissues of the host and eventually breaks out in two different forms of pustules, with different spores. On the upper surface of a leaf a discoloration appears, close inspection of which will reveal a minute opening that leads into a flask-shaped cavity, the pycnium, pycnidium, or spermogonium, into which project the terminal cells of a large number of hyphae. From the ends of these are constricted off the very minute, uninucleate, pycniospores or spermatia, which exude to the surface in a sticky fluid.

Meanwhile large cluster cups, aecia or aecidia, are forming on the lower leaf surface, with basal cells that bud off chains of aeciospores or aecidiospores. This formation will go only so far and will not be completed unless two basidiospores of unlike strain (plus and minus) have germinated on the leaf in question



The life cycle of wheat stem rust. Reproduced from "The Nature and Prevention of Plant Diseases" by Chester.

so as to produce corresponding plus and minus mycelia. When spermatia from a plus mycelium are transferred by insects to a receptive hyphal cell in a spermogonium formed from a minus mycelium, or vice versa, the resulting mycelium is binucleate and grows down through the leaf vigorously and soon forms cluster cups on the lower surface that produce an abundance of aeciospores. These cannot infect barberry but are blown to wheat and start the cycle all over again.

Thus the life history of this parasite involves five kinds of spores—uredospores, teleutospores, basidiospores, pycniospores, and aecidiospores, the first two on wheat, the third free, and the last two on barberry. The aecidiospores, uredospores, the mycelium from each, and the young teleutospores are binucleate or diploid, containing both plus and minus elements; fusion of the two nuclei in the mature teleutospore cell is thus a form of conjugation, and is followed by two rapid nuclear divisions, one of which is reductional, so that the basidiospore is uninucleate and haploid, and either plus or minus. Hence the mycelium germinating from a basidiospore and the resulting spermatia and receptive hyphae are likewise haploid. Fusion of one strain of spermatium with the opposite strain of receptive hypha restores the binucleate, diploid, plus and minus condition. Fuller explanation of the meaning of these events has been given in our article on *Chromosomes* in the Nov., 1942, issue.

Measures for control of this pest, occurring wherever wheat is grown and destroying millions of bushels annually, aim to attack the life cycle at various vulnerable points. Barberry eradication was thought at one time to be a positive means of stamping out the rust completely, but is now known to be effective only in certain regions. The teleutospore is the overwintering stage in northern climates, but in the south uredospores survive the mild winters and start the infection again in the spring, the teleutospores being functionless in such latitudes; likewise they play no part in wheat infestation in Kansas, Oklahoma, and northern Texas, uredospores being blown up from southern Texas and Mexico on the south winds.

The problem is further complicated by the fact that there are at least seven varieties infecting other cereals, barley, rye, and oats, as well as various wild grasses, and still further because in the wheat stem variety alone there are more than 150 known physiological races, each able to attack only certain types of wheat. Selection of a rust-resistant race of wheat therefore depends on a knowledge of all of the races of wheat rust present in a given district or in those from which prevailing winds blow. Dusting wheat fields with sulphur has shown some beneficial effects.

There is lack of knowledge on the part of many growers that there are two distinct and common species of wheat rust, one affecting the stems and another, *Puccinia triticina*, the leaves. Each has a red and a black spore stage; it is consequently advised that the terms red rust and black rust be dropped. Leaf rust is more severe in the southern states, stem rust in the northern states. The alternate host of leaf rust in Europe is the meadow rue, but in America this plant is not involved and the uredospores are the only functional ones, infection being direct from wheat to wheat and continuous.

Wheat stem rust invades the host plant with its mycelium, destroying some tissues and robbing others of nourishment; the sori rupture the host epidermis; the stems become dried, cracked, or broken; and the grains, if developed at all, are few and shriveled. Cold and wet seasons favor the parasite, hot and dry spells, the host. The barberry, on the other hand, is not seriously damaged at all, and the Japanese barberry is immune. In our next issue we shall go into details concerning the preparation of a series of microscope slides for the study of this highly important economic enemy of mankind.

HISTORICAL OUTLINE

Spontaneous generation, most hotly debated of eighteenth century scientific theories, was not laid low by the experiments of Redi with blowflies, but, as we have seen, sprang into a vigorous resurgence upon the discovery of bacteria and other microorganisms. Louis Joblot in 1710 made some hay infusions, just as the beginner in microscopy does today in order to obtain active cultures of protozoa, and found them teeming with life in a few days. This simple performance was regarded in his day as ample proof of spontaneous generation, but it occurred to Joblot that the animalcules might be present on the hay in the first place, or arrive as floating specks in atmospheric dust.

To test his ideas, Joblot boiled a hay infusion to kill all life originally present, then divided it into two portions. One part was left exposed and soon swarmed with life; the other was covered with parch-

References for the Microscopist

For the past several months we have suggested in this column a number of basic books as providing background for work with the microscope. With this issue we are taking the next step and listing our recommendations in six additional fields. In so far as the subjects interest you, buy one of these each month, or as often as you can. They make excellent gifts for others, or as suggestions for those who will wish to remember your birthday.

ALGAE

Fresh-water Algae of the United States, by G. M. Smith. The outstanding complete manual, with descriptions, full accounts, ecology, and collecting.....$6.00

Algae, the Grass of Many Waters, by L. H. Tiffany. An account of this group that will interest all microscopists.....$3.50

BACTERIOLOGY

Fundamentals of Bacteriology, by M. Frobisher. A very complete account of all groups and methods.....$4.00

General Bacteriology, by D. B. Swingle. Briefer treatment than the preceding; very well written and illustrated.....$3.00

OPTICS

Optics and Service Instruments, anonymous. Very good elementary treatment, optical principles and instruments.....$1.75

Introduction to Physiological Optics, by J. P. C. Southall. Advanced text on the physiology of vision.....$5.50

PROTOZOOLOGY

Protozoology, by R. R. Kudo. Comprehensive, illustrated manual of all groups; indispensable.....$6.50

Biology of the Protozoa, by G. N. Calkins. Standard text and reference for the group; not for identification. $7.50

TEXTILES

Textiles and the Microscope, by E. R. Schwarz. Concise and comprehensive manual on use of microscope in analyzing textiles.....$4.00

Textile Fibers: Their Physical, Microscopical, and Chemical Properties, by J. M. Matthews. One of the standard texts and references on this subject.....$10.00

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ment while still hot, and remained sterile. Later this second jar was uncovered, when it shortly teemed with microorganisms. This modern and convincing experiment, far from settling the argument as one would suppose, served on the contrary to stimulate the opposition to renewed efforts.

An Irish priest, John T. Needham, with the backing and approval of the celebrated naturalist, Buffon, decided that the proponents should devise some experiments of their own to prove to the man on the street that spontaneous generation was no illusion. This doctrine bolstered certain aspects of religious faith and hence carried wide appeal. Needham, in 1749, boiled beef broth and sealed the container while the liquid was still boiling. After a few days of storage in a warm room the flask was opened and found to contain many bacteria. Needham explained that every particle of organic matter contained a "vegetative force" that produced the living animalcules, while Buffon went on to state that all living creatures had certain unchangeable parts set free after death, whereupon these particles became very active, fused with one another, and thus gave rise to the new microorganisms.

Needham and Buffon were of the older philosophical school, and, in an earlier age, might have "gotten away with" such views. But, alas for their reputations, they were challenged by an experimental scientist of the first rank, a pioneer in the rising wave of skepticism in matters of dogma. Lazzaro Spallanzani was born at Scandiano, in southern Italy, in 1729, and received an excellent education for that day in arts, science, and the law; later in theology, taking holy orders and becoming an Abbé. However, the Church claimed little of his attention, and at the age of twenty-five he received appointment as professor of logic, mathematics, and Greek at the University of Reggio. In 1760 he succeeded to the chair of natural history—a position more to his liking—at Modena, and in 1768 accepted a similar position at Pavia, where he remained until his death in 1799.

Spallanzani is remembered by students of physiology as the man who swallowed a sponge with a string attached, then pulling the sponge from his stomach and thus obtaining a specimen of gastric juice. This was but a small item in his many experiments on digestion. He also worked on respiration, muscular activity, tissue regeneration, artificial fertilization of frogs' eggs, and many other revolutionary problems that do not concern our present topic. In 1765 Spallanzani performed a long series of demonstrations to refute Needham, claiming that his opponent had used faulty technique, with insufficient heating and imperfect sealing. He boiled decoctions for an hour in flasks with long and slender bent necks, then sealed the neck in a flame. No putrefaction resulted.

Needham asserted that such excessive cooking destroyed the vegetative force of the original broth, but Spallanzani countered by opening one of his sealed and sterile flasks, whereupon the fluid soon began to decay and exhibit bacteria in abundance. Spallanzani decided that if both the culture medium and the air in the container were thoroughly sterilized and then the flask perfectly sealed there would be no spontaneous generation of life.

Next it was claimed that excluding air from the sealed flasks was responsible for purity of the contents, the organisms requiring air for their generation. In answer to this new objection, Schulze, in 1836, forced air through strong acids and bases into a sterile flask of medium, without any contamination, while Schwann, in 1837, passed air through highly-heated tubes and then into the flask, with similar negative results. Now the objectors asserted that the air had been so altered by these treatments that it would no longer support life. Schroeder and Dusch (1853) devised a treatment to overcome this contention, merely stoppering their flasks of sterile broth with cotton plugs. Air could enter, but any organisms floating in the atmosphere were filtered out by the cotton. Incidentally, this is the original use of cotton plugs so universally employed today in all bacteriological procedures.

This experiment should have proved to anyone that organisms will not develop in a nutrient medium if the broth, the container, and the air in the container are properly sterilized, and that infection can enter from the air as soon as such a flask is unplugged—which is exactly what happens. But still the die-hards would not die! Spontaneous generation was to make one more gasp—as we shall see later.

Book Review

What do you know about relativity, the expanding universe, quantum mechanics, and the red shift? So? We thought as much! Well, then, if you have some extra math you're not using stored away in the old cranium, the book for you is *Mr. Tompkins in Wonderland,* by G. Gamow, Professor of Theoretical Physics at George Washington University, and famed for his work on atomic nuclei. This little volume, with its amusing drawings by John Hookham, is dedicated to Lewis Carroll and Niels Bohr, which just about explains the nature of the contents.

Mr. Tompkins, a bank cashier, goes to three lectures on modern physics and then has a number of fanciful dreams in which constants are so changed that minute effects become enormously exaggerated and hence easily observable. Thus he visits a country in which the speed of light is but ten miles an hour, another where gravity is nil, still another in which the maximum diameter of the fully expanded universe is only two hundred miles, and so on. In this way phenomena known to the physicist only by reason of very refined instruments and methods become obvious to the unaided senses and produce absurd effects.

There are six dreams, followed by the three lectures, used as a means to contrast classical with modern physics and to explain the chief findings in relativity. The aim is to make present-day concepts comprehensible to any intelligent layman, and is successful insofar as the subject permits. Since it is not possible to present relativity in terms of Euclidean geometry or Newtonian physics, many ingenious comparisons are introduced, with a minimum of mathematics; yet this minimum will form an insurmountable barrier to those readers lacking sufficient preparation. For those who understand modern constants and equations, the book will be a treat. The situations are amusing and the language well adapted for the purpose. Pp. x, 91; figs. 28. The Macmillan Co., 60 Fifth Ave., New York, 1940. $2.00.

This department is at the service of all those interested in microscopy. If any knotty problems confront you and seem to defy solution send them to this department, Nature Magazine, 1214 Sixteenth Street, N.W., Washington, D. C.